METAL INDUSTRY
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TO OUR READERS

Dr. WALTER R. MEYER

COMMENCING with the November issue, the position of editor will be occupied by Dr. Walter R. Meyer, who really needs no introduction to the metal finishing industry, having as he does, a broad experience in this field and a wide personal acquaintance.

IN 1936 he was awarded the Founders Gold Medal of the A. E. S. and for outstanding work in the electrodeposition of metals he was awarded a Ph. D. in metallurgy from Yale University in 1937. The same year Dr. Meyer presented a paper at the international conference on Electrodeposition at London, England. He has studied laboratory and factory methods in England, Holland, Germany and Sweden.

IN THIS COUNTRY he is well known for his active participation in the American Electro-Platers' Society, where he serves on the Research committee. Dr. Meyer is also a member of The American Society for Metals, The Electrochemical Society, The Faraday Society, Deutsche Bunsen Gesellschaft, Electrodepositor's Technical Society (England) and Sigma Xi.

FOLLOWING his graduation from Yale University in 1928 where he obtained the degree of B. S. in Chemistry with the ranking of magna cum laude, Dr. Meyer accepted the position of chief chemist at Sargent & Co., New Haven, Connecticut, where he did development work in electro-chemistry, lacquer formulation, casting of nickel alloys and hydraulic fluids.

SINCE 1931 he has been associated with the General Electric Company, Bridgeport, Connecticut, as chief metallurgist and electrochemist. Here Dr. Meyer's work was concerned with electrochemistry, hot galvanizing, detergents, analytical methods, spectroscopy, acid treatment of metals, extrusion of lead, metallography, rubber fillers and lubrication.

Editorial

Recovery—Maintained

Recovery which began in July and continued through August, has been maintained during September. Business index figures are still rising; steel operations have stepped up to 47 per cent; prices of the important basic metals—copper, zinc and lead—have increased. Evidence directly in our own industry comes from Waterbury, Conn., showing gains in the number of people employed in factories.

The same evidence, however, shows that we must continue to gain in order to return to a good rate of operations. Industrial employment in Waterbury, in July, was still 22 per cent under the same month in 1937. Business sentiment has greatly improved as a result of the settlement of the European crisis.

Safeguards in Metal Finishing

Metal finishing is not one of the hazardous industries. Nevertheless, there are departments in which care must be exercised, and proper safeguards set up to protect the worker. Chromium plating tanks must have a heavy downdraft exhaust; polishing wheels must be guarded and adequately exhausted. Lacquers are known to present hazards in fire and toxicity.

An interesting article in the Industrial Bulletin of the State of New York for July points out that the health hazard presented by the nitrocellulose base of lacquers, is of no significance. For practical purpose the toxicity of the lacquer depends upon the evaporation of the volatile fraction which varies from 75% by weight to as much as 93%, depending upon the amount of thinner added. Concentration of vapors in the atmosphere must be kept at a minimum by the use of hoods with sufficient draft. Absorption may also take place through the skin, so the practice of some lacquer workers of indiscriminately using solvents to wash their hands should be discouraged. Although some of the pigments used may be toxic, protective measures which control the hazards due to volatile materials will automatically eliminate any possible danger in toxic pigments.

Since practically all the solvents and diluents in present day use are highly inflammable and are readily volatile, a fire hazard is present which must be guarded against by fireproof storage, proper protection of electrical equipment and an adequate supply of fire extinguishers.

And (as in all situations of this kind) the most important element in minimizing health hazards is the education of the workers and unremitting vigilance on the part of the supervisors and executives.

Plating to Specifications

Just as the industrial world generally has accepted specifications as an indispensable aid in purchasing supplies and parts, so have the progressive elements of the electroplating industry accepted specifications for metal deposits. Why then, are such specifications not universally used?

There are two reasons. First (except for the few industries of which the automotive is the outstanding example) the buyer of plated work has not yet demanded them, and this inertia has been transmitted to the seller. Second, plating to thickness specifications is complicated by a condition peculiar to that process—that the metal is deposited at different rates in different parts of a solution, resulting in deposits of varying thickness. Specifications for "average thickness" leave the recesses and the centers of pieces below standard; specifications for minimum thickness force the building up of corners and edges far beyond specifications. Obviously both extremes are disadvantageous. The task (described by Joseph Haas on page 478 of this issue) calls for the closest control of solutions, the right equipment, anodes, racks and methods of handling the work.

The apathy of the buyer will eventually disappear. The trend of the times directed by public opinion is constantly forcing the improvement of the finished metal product. The difficulties in the way of uniform plating can be overcome by careful control of operations. The plating industry must—and will—be ready to supply the demand for specification plating.

Interest in Plating Research

The large attendance at the September 16th meeting of the Research Committee, which was attended by 19 of the 22 members of the Committee as well as over a score of non-committee members, offers striking testimony for the interest in research work on electroplating which is being conducted at the Bureau of Standards under the auspices of the American Electroplaters' Society. Chairman, George Hogaboom, wisely selected a large committee of wide geographical distribution representing all branches of electroplating.

A long discussion took place on the future activities of the Research Associates with particular consideration of the effects of the basis metal on corrosion resistance. Preliminary studies will be made to determine the advisability of a comprehensive study on this problem. The plan to issue periodic bulletins or news letters to subscribers of the research fund should do much to convince subscribers of the value of the work which they are sponsoring.

Metal Products and Metal Finishing at the Metal Show

The most important metal meeting of the year. Many papers on non-ferrous metals. Exhibits feature grinding and polishing machines, instruments for measuring, recording and controlling, metal cleaning, melting and heat treating, metals, alloys and metal products, metal working machinery, joining and welding.

DURING the week of October 17-21, Detroit will be host to the National Metal Exposition and Congress sponsored by the American Society for Metals. This gathering, known as "The Metal Show" or "National Metal Week," is the largest annual meeting of technical and practical men engaged in the metal products manufacturing industries in the United States. More than 230 of the leading companies in this field have taken space as exhibitors, making the Exposition already far larger than last year's.

The technical program, which will bring 10,000 metal men to Detroit, will include two educational courses, one on Machinability of Steels and Non-Ferrous Metals, and the other on Pyrometry. Government, colleges and industry are well represented among the 76 men who have done a great deal of research during the past year on this program.*

Four of the great national technical societies of the United States will hold their annual conventions in Detroit during the week of the Congress and Exposition. The American Society for Metals, Institute of Metals Division of the A.I.M.E., the American Welding Society and the Wire Association will hold sessions at which more than 100 papers will be read. One of the annual features of the technical program is the *Edward De Mille Campbell Memorial Lecture*, delivered each year by an outstanding authority in the metal field. This year's Lecturer will be *A. L. Boegehold*, Head of the Metallurgical Department, General Motors Corp., Research Laboratories Division.

The technical sessions of the American Society for Metals will be held at the Convention Hall.

*Due to unsettled conditions abroad, the visit of the British Institute of Metals and the Iron and Steel Institute was cancelled.

The Technical Program

Among the papers to be read and discussed at the technical sessions of the various Societies are the following:

American Society for Metals

Pyrometry, by R. B. Sosman, Research Laboratories, U. S. Steel Corporation (8:00 P.M. daily, Monday to Wednesday, Oct. 17-19 inclusive).

Some Properties of Oxygen-Free High Conductivity Copper (OFHC), by C. G. Goetzel, Hardy Metallurgical Co., New York. (Morning, Tuesday, Oct. 18).

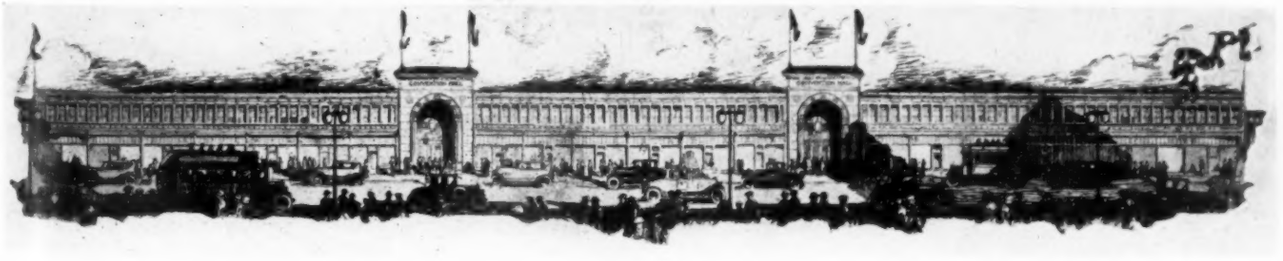
A New 70/30 Nickel-Copper Alloy Subject to Precipitation Hardening, by Erich Fetz, Wilbur B. Driver, Newark, N. J. (Morning, Tuesday, Oct. 18).

Effects of Substantial Additions of Aluminum, Cobalt, Titanium and Columbium on the Properties of 80 Ni-20 Cr Alloys, by A. L. Sanford and O. E. Harder, Battelle Memorial Institute, Columbus, Ohio. (Morning, Tuesday, Oct. 18).

Machining Non-Ferrous Materials (Cast and Wrought), by H. P. Croft, Chase Brass and Copper Co., Cleveland, Ohio. (4:30 P.M., Friday, Oct. 21).

Institute of Metals Division, A.I.M.E.

All technical sessions will be held at the Book-Cadillac Hotel.



The Convention Hall, Detroit, Mich., where the National Metal Exposition will be held. METAL INDUSTRY *will occupy Booth C-318.*

Dr. G. B. WATERHOUSE
President, A.S.M.

MONDAY, OCT. 17

10:00 A.M. *Rates of Diffusion of Copper and Zinc in Alpha Brass*, by Ernest O. Kirkendall, Instr., Wayne Univ., Lars Thomassen and Clair Upthegrove, Professors, Univ. of Michigan.

The Plastic Deformation and Subsequent Recrystallization of Single Cystrals of Alpha Brass, by M. R. Pickus, Dept. of Met., and C. H. Mathewson, Prof. of Met., Yale Univ.

The Development of Abnormally Large Grain Sizes in Rolled and Annealed Copper Sheet, by Maurice Cook, Asst. Res. Mgr., and C. Macquarie, Res. Met., I. C. I Metals Ltd.

2:00 P.M. *Superlattices: The Effect of Silver on the Gold-Copper Superlattice, Au Cu*, by Ralph Hultgren, Asst. Prof. of Met., Harvard Univ., and Lester Tarnopol, Asst. Prof. of Met., Univ. of Kentucky.

The Plastic Flow of Metals, by C. W. MacGregor, Associate Prof. in Mech. Engrg., Mass. Inst. of Tech. As a part of this paper will be shown motion pictures of metals undergoing plastic deformation.

Electron Diffraction Effects from Polished Zinc Surfaces, by M. L. Fuller, Investigator, Res. Div., N. J. Zinc Co.

8:30 P.M. Crystal Ballroom, Book-Cadillac Hotel.

Autumn Lecture of The Institute of Metals of Great Britain—with The Iron and Steel Institute of Great Britain and the Institute of Metals and Iron and Steel Divisions, A. I. M. E. "*Gases and Metals*," by Dr. Colin J. Smithells, General Electric Co., Ltd., Wembley, England.

TUESDAY, OCT. 18

10:00 A.M. *The Effect of Silver Additions on the Physical Properties of the Tin-Bronzes*, by A. J. Dornblatt, Senior Res. Assoc., S. V. Wilson, Res. Assoc., and A. M. Setapen, Res. Assoc., National Bureau of Standards.

The Microhardness of Bearing Alloys, by L. L. Swift, Control Met., The Cleveland Graphite Bronze Company.

The Possibilities of Silver-rich Alloys as Bearing Materials, by R. W. Dayton, Met., Battelle Memorial Institute.

2:00 P.M. *The Effect of Plastic Deformation on the Age-Hardening of Duralumin*, by Robert W. Lindsay, Dept. of Met., and John T. Norton, Assoc. Prof. of Physics of Metals, Mass. Inst. of Tech.

The Age-Hardening of Duralumin, by Morris Cohen, Asst. Prof., Mass. Inst. of Tech.

The Solubility of Lead and Bismuth in Liquid Aluminum and Aluminum - copper Alloys, by L. W. Kempf, Met., and Kent R. Van Horn, Res. Met., Aluminum Res. Labs., Alum. Co. of America.

Dr. R. F. MEHL
Chairman, Institute of Metals Division, A.I.M.E.

W. H. EISENMAN
Secretary, A.S.M.

WEDNESDAY, OCT. 19

2:00 P.M. *Tarnish Films on Copper*, by J. B. Dyess and Henry A. Miley, Oklahoma Agri. & Mech. Coll.

Special Methods for Polishing Metal Specimens for Metallographic Examination, by D. Bergekoff and W. D. Forgeng, Union Carbide and Carbon Res. Labs., Inc.

Studies Upon the Corrosion of Tin, II.—The Effects of Other Anions in Carbonate Solutions, by Gerhard Derge, Asst. Met., and Harold Markus, Metals Res. Lab., Carnegie Inst. of Tech.

Equilibrium Relations in Aluminum-Zirconium Alloys of High Purity, by William L. Fink, Res. Met., and L. A. Willey, Aluminum Res. Labs., Aluminum Co. of America.

Wire Association

All technical sessions will be held at the Detroit-Leland Hotel. The papers include the following:

The Effect of Various Degrees of Cold Working and of Various Impurities on the Annealing Temperatures of Copper Wire, by L. B. Barker, Testing Engineer, General Electric Co., Schenectady, N. Y., (Monday, Oct. 17).

The Development of High Strength Electrical Conductors and Messenger Cable, by C. H. Davis, Metallurgist, American Brass Co., Waterbury, Conn. (Monday, Oct. 17).

Chromium Copper Alloy Wire, by C. H. Davis, Metallurgist, American Brass Co., Waterbury, Conn. (Monday, Oct. 17).

Heating Copper Wirebars, by J. A. Doyle, Engineer, W. S. Rockwell Co., 50 Church St., N. Y. City. (Tuesday, Oct. 18).

A paper of special interest to readers of METAL INDUSTRY is "*Production of Aluminum Coated Steel and Other Coated Metals from a Hydrogen Furnace*," by Prof. Colin G. Fink, Electrochemist, Columbia University, New York. (Tuesday, Oct. 18).

American Welding Society

All technical sessions will be held at the Book-Cadillac Hotel. Papers will include the following:

The Effect of Current, Pressure and Time on the Shear Strength and Structure of Spot Welds in the Aluminum Alloys, by G. O. Hoglund and G. S. Bernard, Jr., Aluminum Co. of America, Pittsburgh, Pa. (Monday, Oct. 17th; 2:00 P.M.)

An Investigation of Arc and Gas Welded Joints in Aluminum and Aluminum Alloys, by Lieut. Commander R. K. Wells, (CC) U.S.N. and A. G. Bissell, Bureau of Construction and Repair, Navy Dept. (Monday, Oct. 17th; 2:00 P.M.)

Brazing Tubes in High-Pressure Boilers with Silver Alloys, by A. W. Weir, New York Central Railroad and H. M. Webber, General Electric Co. (Tuesday, Oct. 18; 9:30 A.M.)

Welding Bronze and Non-Ferrous Alloy Piping, by H. D. Lanterman, Carbide and Carbon Chemicals Corp. (Tuesday, Oct. 18th; 9:30 A.M.)

Bronze-Welding, by W. S. Walker, The Linde Air Products Co. (Tuesday, Oct. 18th; 2:00 P.M.)

Progress in Copper Welding, by Ira T. Hook, research engineer and Clinton E. Swift, welding engineer, American Brass Co. (Wednesday, Oct. 19th; 9:30 A.M.)

Carbon Arc Welding of Silicon Bronzes, by E. S. Bunn, J. R. Hunter and W. G. Seidlitz, Revere Copper and Brass, Inc. (Wednesday, Oct. 19th; 9:30 A.M.)

Exhibits

The Exposition to be held at the Convention Hall will include exhibits of metals, metal products, metal working and manufacturing equipment and supplies of every imaginable variety. As stated above, over 230 firms have contracted for space. We give below, classified into the various types of products, descriptions of the exhibits which will be of special interest to METAL INDUSTRY readers.

Grinding and Polishing

Crown Rheostat & Supply Co., 1910 Maypole Ave., Chicago, Ill. New variable speed polishing lathe with a range from 850 to 3150 RPM (and intermediate speeds); controlled by merely turning a small control wheel and without stopping the machine. Also a new work-holding device and method of finishing with application to a wide number of products.

Black and Decker Mfg. Co., Towson, Md. Portable electric tools and accessories, especially grinders, sanders and other abrasive tools, with Universal motors and High Cycle motors. Featured items will be a complete line of portable grinders; a complete line of sanders; a new Lectroshear for cutting sheet metal; two new electric drills; a complete line of High Cycle abrasive tools.

In attendance: *G. H. Treslar*, Asst. Sales Mgr; *Geo. W. Herbst*, Sales Eng; *J. F. Apsey, Jr.*, Adv. Mgr; *J. M. Schreiner*, Detroit Manager; *T. H. Belling*, Chicago Manager; *W. J. Fenwick*, Cleveland Manager; *F. R. Stoiber*, Salesman; *L. R. Gavan*, Salesman; *Lloyd Stainton*, Salesman; *W. G. Williams*, Salesman.

Carborundum Co., Niagara Falls, N. Y. All of the various grinding wheels used in the metal industry for grinding crankshafts, rolls, centerless grinding, snagging, etc. (For other products, see section on Melting and Heat Treating, below).

In attendance: *S. F. Courter*; *F. J. Tone, Jr*; *B. H. Work*; *A. H. Prey*, *C. J. Steuber*; *C. H. Niekamp*; *J. Storm*; *R. W. Place*; *J. H. Thomas.*

Macklin Co., Jackson, Mich. A miniature swing frame grinder in actual operation—"throwing sparks".

In attendance: *T. J. McIntyre*, president; *B. F. Mc Intyre*, vice-president; *N. H. Balz*, district sales manager; *C. C. McParlan*; *Wm. Scholes*; *M. E. Starr.*

Production Machine Co., Greenfield, Mass. Type 101 centerless feed polishing machine for cylindrical work; Type S centerless grinder and polisher combined with an abrasive belt grinder or polisher; Type 606 bench surfacer for cleaning and finishing casting dies, stampings, etc.; Type 608 a new metal surfacing machine.

In attendance: *William S. Howe*, president; *Arthur H. Behnke*, vice-president and sales manager; *Thomas A. Welch*, superintendent.

Metal Cleaning

American Foundry Equipment Co., Mishawaka, Ind. No. 1 Wheelabrator Multi-Tablast, ventilated by an assembled "Dustube" dust collector; airless abrasive blasting equipment.

In attendance: *Otto A. Pfaff*, Vice-President and General Manager; *L. L. Andrus*, General Sales Manager; *A. E. Lenhard*, Advertising Manager and *A. Nicolini.*

Presses and shears in action on aluminum and other metals in the Curtiss Aeroplane factory. (Courtesy Niagara Machine & Tool Works, Buffalo, N. Y.)

G. S. Blakeslee & Co., 19th Street & 52nd Ave., Chicago, Ill. Two full size Blakeslee solvent degreasing machines and one full size single tank Niagara metal parts washer. One of the degreasers will be in operation; both will show the new Blakeslee water separator, standard equipment on the Blakeslee degreasers.

A special feature will be a glass model degreaser in operation and will show plainly the principle of this cleaning process.

J. B. Ford Sales Co., Wyandotte, Mich. Complete display of Wyandotte specialized metal cleaners for plating, lacquering, enameling, japanning and vitreous enameling; for use in still solutions, electro-cleaning solutions, metal parts washing machines, tumbling barrels and spray gun equipment; for cleaning before Bonderizing, Chromodizing, Parkerizing, anodizing, hot tinning, galvanizing, and assembling. For removing lacquer, japan, carbonized mineral oils, and fabricating compounds. Wyandotte burnishing compounds for all burnishing problems. Wyandotte neutralizers for neutralizing acid after pickling operations. Wyandotte specialized cleaners for cleaning railway equipment, aeroplane and automotive equipment.

In attendance: *B. N. Goodell*, Mgr. Industrial Dept: *W. M. Cole*, Asst. Mgr. Industrial Dept; *C. R. Beaubien* and *C. L. Southwick*.

Oakite Products, Inc., 22 Thames St., New York City. Improved methods and materials for cleaning work of widely varied character. A new cleaning material to help solve production problems in the plating of bright nickel and chromium, with much greater tolerance for chromic acid. Oakite materials specially designed for cleaning aluminum, brass, zinc, tin, die cast alloys and other sensitive alloys without tarnishing, discoloring or etching.

In attendance: *E. C. Rinker*, Technical Research Div.; *H. C. Duggan, E. Lacy, R. B. Potter, N. P. Armstrong, R. J. Crane, E. S. Bradley, V. Heinrich and H. L. Gray*.

Pangborn Corp., Hagerstown, Md. Rotoblast cleaning equipment; latest improvements and designs.

In attendance: *P. J. Potter*, vice-president; *Victor F. Stine*, 2nd vice-president and sales manager; *Chas. A. Bultman*, district manager; *L. W. Unger, L. W. Wagner, R. E. Donnelly, R. M. Trent*, and *A. L. Gardner*, advertising manager.

Metal Finishing

Alox Corporation, Buffalo Ave., Niagara Falls, N. Y. Various types of anti-corrosion products, applicable to ferrous, non-ferrous and alloy metal production.

In attendance: *James E. Shields*, technical sales manager; *Dr. A. W. Burwell*, vice-president and technical director; *W. H. Clark*, president; *James W. Doyle*.

Binks Manufacturing Co., 3114 Carroll Ave., Chicago, Ill. A novel exhibit, the painting of landscapes and sea scenes by an artist using the same large production spray guns as are used to finish metal products. The work is done in the new water curtain spray booth unit, the Binks Dynaprecipitor.

In attendance: *J. F. Roche*, President; *J. F. Roche, Jr., S. Bramsen*, Vice-Presidents; *E. F. Watts*, Advertising Manager; *A. W. Christenson, F. G. Garreson, F. M. Johnson, W. F. Young* and *Ralph DeGaynor*, artist.

Bright Nickel Corporation, 2177 E. Milwaukee St., Detroit, Mich. Exhibit of bright nickel deposits made by the Schloetter process.

In attendance: *Paul Amundsen*.

E. I. duPont de Nemours & Co., Inc., Electroplating Division, Wilmington, Dela. Chemicals and processes for modern metal finishing. An electroplating unit demonstrating new processes recently developed.

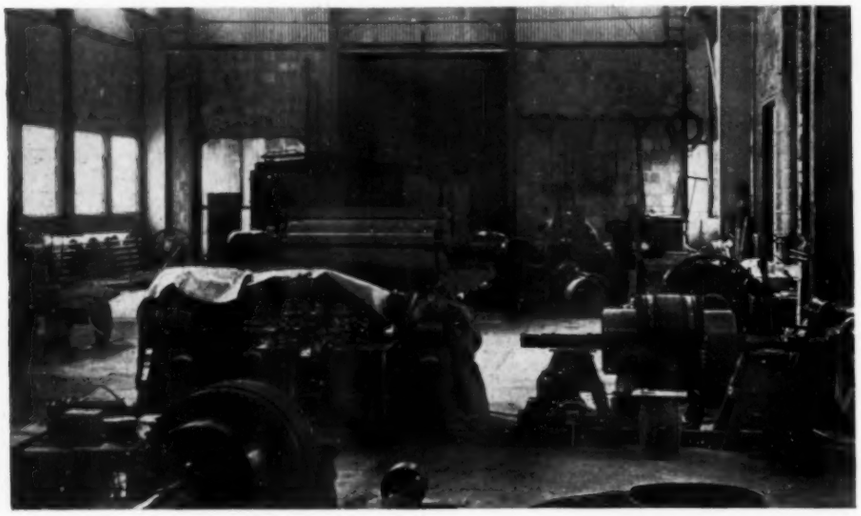
In attendance: Electroplating Chemicals Division: *J. C. Pickard*, manager; *C. M. Hoff*, assistant manager; *F. F. Oplinger, H. H. Blouch, H. W. Kennedy, W. Bayer, E. Schweikher, H. L. Benner* and *E. C. Friedl*.

Parker Rust-Proof Company, 2177 E. Milwaukee Avenue, Detroit, Mich. A revolving globe illustrating the world-wide acceptance of Parkerizing and Bonderizing rust proofing processes. A mechanically operated book illustrating the industries and manufacturers using Parker processes. Metal pieces have been subjected to various types of accelerated corrosion tests. The booth will be shared with the *Bright Nickel Corporation*.

Metals, Alloys and Metal Products

Aluminum Co. of America, Pittsburgh, Pa. Individual exhibits for each of the products manufactured by the company. Demonstration of welding of aluminum by the torch method. Moving pictures showing the production of aluminum from mine to metal and also various methods of fabrication.

American Brass Co., Waterbury, Conn. Anaconda copper and copper alloy welding rods, featuring a demonstration of both electric and oxy-acetylene welding. Displays of special



An assembly shop for electroplating equipment. (Courtesy Hanson-Van Winkle-Munning Co., Matawan, N. J.)

alloys including the high strength engineering alloy, Everdur silicon-copper, Avialite, copper-aluminum alloy used for valve seats, guides and spark plug bushings in aeroplane and other internal combustion engines, and Anaconda beryllium copper, a high strength heat treatable copper rich alloy. Also die pressed forgings, extruded shapes and pressure die castings as well as super-nickel and phosphor bronze head plates.

In attendance: *T. B. Smith, E. B. Brown* and *C. E. Swift.*

Ampco Metal, Inc., 3830 W. Burnham St., Milwaukee, Wisc. Finished machined parts made from Ampco metal including gears, shifters, sleeves, etc.; also examples of Ampco metal parts in pickling for resistance to corrosion, etc; acid equipment, pickling baskets, safety tools and parts formed or drawn on Ampco dies, etc.

In attendance: *Ray W. Uecker*, Secretary-Treasurer; *J. D. Zaiser* and *R. J. Thompson.*

Chase Brass & Copper Co., Waterbury, Conn. Examples of welded and fabricated products of Chase brass, copper and bronze. Demonstrations of welding copper and Olympic bronze; butt welds, fillet welds and lap welds on copper, bronze and steel, Olympic bronze tanks and water heaters; welded copper bus tube assemblies; 12" welded Olympic bronze fittings and fabricated pipe; copper headers, copper fin tubing, brass forgings, Olympic bronze evaporators, deep drawn shells, hot rolled angles and welding rods. A working model of a newly designed sluice gate made of Olympic bronze for sewerage work.

In attendance: *J. J. Vreeland, Dr. D. K. Crampton, O. W. Harrington, Robert Lea, H. P. Croft and Francis Gallo.*

Dow Chemical Co., Midland, Mich. Manufactured products using Dowmetal, either wholly or in part, as well as a miscellaneous assortment of Dowmetal sand and die castings, extruded shapes, sheet and plate.

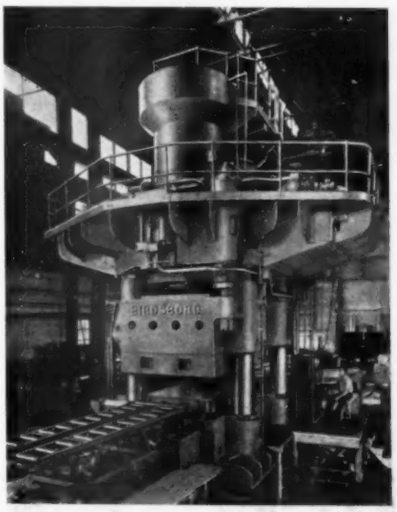
Driver-Harris Company, Harrison, N. J. Equipment for heat treating furnaces. Heat and corrosion resisting alloys, Nichrome, Chromax and Cimet.

In attendance: *F. V. Lindsey*, vice-president; *W. E. Blythe, K. H. Hobbie, J. B. Shelby, J. Sammon, A. J. Eckley, E. A. Terwell, H. M. Thornquist, L. V. Prior*, and *R. Beatty.*

International Nickel Co. Inc., 67 Wall St., New York City. Typical specimens of each of the 25 alloys containing nickel in amounts varying from ½% to 99.95%. In attendance will be members of the Development and Research Division, Nickel Sales Department and Monel and Rolled Nickel Departments, to consult with visitors on metallurgical problems involving the application of nickel alloys.

New Jersey Zinc Co., 160 Front St., New York. Die casting alloys, both as cast and finished; also completely assembled products to show the manner in which the die castings are used. The high spot will be a revolving turntable depicting the evolution of the Oldsmobile die cast radiator grille from 1935 to 1939.

In attendance: *A. E. Mervine*, Manager, Metal Sales; *W. W. Broughton,*



The world's largest hydraulic press for the shearing and forming of airplane parts. One of a number under construction for the Russian Government, it has a platen area of 200 by 90 inches, a 54 inch stroke, and can exert a working pressure of 5500 tons. Designed and built by the Birdsboro Steel Foundry and Machine Company, Birdsboro, Pa.

S. E. Maxon, R. L. Wilcox, D. P. Brannin, R. Burns, W. P. Hardenbergh, Jr., R. Davison, Manager, Market Development Division, *E. K. Vaughan, C. R. Maxon, R. E. Kellers, H. W. Smith*, and *R. G. Kenly*, Manager, Rolled Metal Sales.

The Torrington Mfg. Co., Torrington, Conn. W-22 clutch type coiler, W-31 torsion spring machine and W-11 segment type coiler. Full new line of spring making machines.

In attendance: *Alexis Doster*, Vice-President; *C. R. Bergevin, Henry Nigro and Arthur Nigro*, Superintendent.

Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa. Display of alloys including phos-copper, Cupaloy, Kovar and Konal. Samples of new brazing applications in the electric furnace.

In attendance: *W. R. Bernardi, E. H. Vedder, J. F. Kelly, W. W. Reddie, R. W. Staggs, J. H. Germany, T. Simpers, L. M. Gumm, O. G. Rutemiller* and *D. D. Pence.*

Metal Melting and Heat Treating

Ajax Electric Co. Inc., Frankford Ave. & Allen St., Philadelphia, Pa. Ajax-Hultgren salt bath furnace in operation; photographic displays of Ajax electric heat treating furnaces; moving pictures showing furnaces in actual use.

In attendance: *Dr. G. H. Clamer*, President; *Wm. Adam, Jr.*, Vice-President; *John E. Haig*, Secretary; *J. E. Bullock, Lloyd Williston, A. A. Anderson E. E. Bolds* and *Ben L. Crew.*

Ajax Electrothermic Corp., Ajax Park, Trenton, N. J. Small high frequency converter heating billets and tubes and automatically ejecting them into quenching tanks when the proper temperature is obtained; also additional heating coils to demonstrate other induction heating applications.

In attendance: *Dr. G. H. Clamer*, President; *Dudley Wilcox*, Treasurer; *K. N. Blakeslee*, Secretary and *A. D. Meyer*, Metallurgist.

Botfield Refractories Company, Swanson & Clymer Streets, Philadelphia, Pa. High temperature cements, chrome ore plastics, insulating fire brick and high temperature insulating cement.

Carborundum Co., Niagara Falls, N. Y., *Globar Division.* Various types of non-metallic, high temperature heating elements for various metal heating furnaces.

In attendance: *K. Rogers* and *B. Bovee.*

Carborundum Co., Niagara Falls, N. Y., *Refractory Division*. Super-refractories in the form of bricks, tile muffles, etc. for various types of high temperature heating operations.

In attendance: *R. A. Barr, C. E. Hawke* and *N. Berry*.

Despatch Oven Company, 600-9th Street, S. E. Minneapolis, Minn. Pot type dense load furnace in operation at temperatures up to 1250 deg. F.; gas heated.

In attendance: *A. E. Grapp*, president; *H. L. Grapp*, vice-president; *F. H. Faber*, secretary and sales manager; *A. L. Kershaw, G. A. Webb, A. W. Anderson, C. O. Anderson, C. E. Noble, E. H. Seelbach, L. R. Nourie, K. J. Papke, C. S. Gordon, A. G. Batsner, F. D. Rice, T. N. Holden, S. H. Baylor* and *S. A. Silbermann*.

Electric Furnace Co., Salem, Ohio. Photographs of recent furnace installations and latest developments in special atmosphere equipment for copper brazing, scale-free heat treating and bright annealing ferrous and non-ferrous products, including wire, tubing, strip, stampings, etc.; samples of material treated in these furnaces; pictures of gas-fired radiant tube furnaces and Elfurno special atmosphere generator.

In attendance: *R. F. Benzinger*, President; *F. T. Cope*, General Manager; *A. H. Vaughan*, Chief Engineer; *C. L. West*, Vice-President; *K. U. Wirtz, C. H. Vaughan, N. H. Knowlton, G. P. Lozier, S. J. Eberwein, B. C. Thompson and A. E. Wright*, Advertising Manager.

Hauck Manufacturing Co., 126-10th St., Brooklyn, N. Y. Multiple proportioning low pressure oil burners with automatic control hook-up: Proportioning low pressure gas burners; also a demonstration of the proportioning and atomizing of the Hauck burners compared to standard oil burners.

In attendance: *Herbert Vogelsang, Jules Escheman, A. J. Turpin*, and *F. John Schwenk*, sales manager.

C. I. Hayes, Inc., 129 Baker St., Providence, R. I. "Certain Curtain" tool hardening furnaces equipped with patented atmosphere control features as well as external combustion gas generators. Also a photographic display of the various types of electric heat treating equipment manufactured by the company.

In attendance: *C. I. Hayes*, President; *J. E. Hines*, Vice-President and Sales Manager; *W. R. Gilbert*, Chief Engineer; *C. G. Paulson, K. W. Pettigrew, C. A. Hooker, E. F. Burke, J. E. Figner* and *R. G. Hess*.

Lava Crucible Company, Pittsburgh, Pa. Standard and special shapes in super refractories of silicon-carbide, mullite, fused alumina and zirconia. Also plastic ramming mixtures and cements.

In attendance: *Furman South, Jr.*, president; *Harold E. White*, vice-president; *Daniel E. MacLean*, sales manager and *C. H. Knappenberger*, Michigan representative.

Joining and Welding

Automatic Gasflux Co., Citizens Bldg., Cleveland, Ohio. Bronze welding of various metals in operation; also various types of equipment for this work.

In attendance: *W. L. Ulmer*, general manager; *C. A. Medsker*, chief engineer; *J. M. Bialosky* and *J. L. Sullivan*.

General Electric Co., Schenectady, N. Y. A full line of arc welding equipment and accessories and a comprehensive display of industrial products manufactured through the use of electric heat. The welding equipment will be in actual operation. The heating display will illustrate typical products and parts requiring such processes as copper-brazing, bright annealing and scale-free hardening furnaces. The new Glyptal 1294, a material for preventing weld spatter from adhering to welded parts will be demonstrated.

Copper sheet stock used for making copper pipe by bronze-welding. (Courtesy Linde Air Products Company, New York.)

In attendance: *C. L. Ipsen, L. D. Meeker, H. M. Webber, B. C. Tracey, R. M. Cherry, W. A. Terry, E. W. Cunningham, W. V. Brady, H. E. Scarbrough, H. P. Doud, F. H. Hill, H. O. Westendarp, Jr., R. F. Newell, R. L. Smallman* and *E. Vom Steeg, Jr.*

Handy & Harman, 82 Fulton Street, New York. Low temperature brazing will be featured. The main attraction will be a high pressure steam boiler used by the New York Central Railroad for heat and hot water on their electrified trains. In this boiler 1237 copper tubes are joined to steel headers by the low temperature brazing alloy "Easy-Flo". A series of slides will show the brazing process. Many other samples of work done with Sil-Fos, Easy-Flo and Handy Flux will be displayed. Actual demonstrations of joining ferrous and non-ferrous metals with these alloys will be carried on continuously. Silver clad plate and powdered metals containing silver will be shown.

Hobart Bros Company, Troy, Ohio. Arc Welding equipment; a complete line of the new Hobart Multi-Range arc welders with continuous demonstrations. Samples of welded joints of all types of metals.

In attendance: *E. A. Hobart*, president; *W. H. Hobart*, vice-president; *O. H. Menke*, factory manager; *W. J. Chaffe, Roy Smith, E. K. Butterfield* and *R. C. Bercaw*.

Krembs & Company, 669 W. Ohio Street, Chicago, Ill. "Fluxine" fluxes for brazing, welding, silver and soft soldering. "Braz-Weld" self-fluxing, color match rods. The company will distribute their new Fluxine Chart, which indicates every process in common use for joining metals and the fluxes recommended.

In attendance: *O. M. Krembs*, president; *C. P. Feebusch*, chief engineer.

Linde Air Products Co., in connection with *Electro Metallurgical Co.*

and *Haynes Stellite Co.*, associated units of *Union Carbide and Carbon Corp.*, 205 E. 42nd St., New York. Exhibit will emphasize the wide scope of oxy-acetylene applications that have been developed or improved within recent years. Actual demonstrations of machine-cutting, flame-hardening and flame-softening; also oxy-acetylene welding and cutting equipment. A display of the Unionmelt welding process, a new electric welding method.

P. R. Mallory and Co., Inc., Indianapolis, Ind. Electrodes, spot welding tips, seam welding wheels, projection welding plugs, butt and flash welding dies and water cooled holders. Photographic display of resistance welding operations; display of similar and dissimilar metals showing the advantages of spot welding. Castings, forgings and finished machined parts of the various Mallory non-ferrous alloys having high electrical and thermal conductivity and great strength. Mallory electrical contacts for every service where a circuit must be made or broken. Special parts fabricated by Mallory from tungsten and molybdenum sheet and ribbon.

In attendance: *P. R. Mallory*, President; *J. A. Weiger*, Vice-President and Sales Manager; *J. D. Tebben*, Sales Manager Detroit District; *L. E. Arnold*, Assistant Sales Manager Detroit District; *Dr. F. R. Hensel*, Consulting Engineer; *P. N. Cook*, Advertising Manager.

Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa. Line of Flexarc welders up to 500 amperes; A-C welding electrodes; 200 and 300 ampere motor generator set; automatic welding equipment in operation; Weld-o-trol for timing spot and resistance welders; splash-proof motor, dust-proof motor, etc.

In attendance: *W. R. Bernardi, E. H. Vedder, J. F. Kelly, W. W. Reddie, R. W. Staggs, J. H. Germany, T. Simpers, L. M. Gumm, O. G. Rutemiller*, and *D. D. Pence*.

Instruments—Measuring, Recording and Controlling

Bristol Company, Waterbury, Conn. Pyromaster potentiometer and its applications in the metal industries will be featured. Air-operated and electric controllers will be exhibited in operation to demonstrate close temperature control in electric and fuel-fired furnaces and ovens. A new electronic controller will be exhibited for the first time. Ardometer radiation pyrometer and Pyrotrol for protecting gas-fired ovens against explosions will be shown in operation. A low-range draft controller and air-fuel ratio controller will also be displayed.

Reclamation of faulty aluminum casting by the oxy-acetylene torch. (Courtesy, Linde Air Products Co., New York.)

Brown Instrument Co., Philadelphia, Pa. Indicating, recording, controlling instruments and auxiliary equipment used in the production, fabrication and heat treatment of both ferrous and non-ferrous metals. Electrically and pneumatically operated thermometers for die-casting machines, ovens, tempering tanks and other services up to 1200°F; also electrically and pneumatically operated control potentiometers for use with thermocouples or radiation pyrometers for hardening, brazing and annealing furnaces or other services up to 3400°F.

In attendance: *E. B. Evleth*, vice-president and general manager; *L. Morton Morley*, vice-president and general sales manager; *R. L. Goetzenberger*, vice-president; *H. M. Schmitt*, Philadelphia; *C. L. White*, Detroit; *H. P. Osgood*, Detroit; *W. R. Moore*, Cleveland; *C. W. Lugar*, Cleveland; *J. P. Clark*, Cleveland; *C. N. Sherwin*, Detroit; *R. A. Weikel*, Philadelphia; *W. F. Arnoldy*, Detroit; *W. R. Sokel*, Detroit; *R. H. Perry*, Cleveland; *J. Maher*, Cleveland; *G. E. Flower*, Toledo.

Harry W. Dietert Company, 9330 Roselawn Avenue, Detroit Mich. Complete line of spectrographic equipment, in operation, for qualitative and quantitative analysis of all metals, ores and paints. Sand testing equipment for moisture, permeability and strength in operation.

In attendance: *Harry W. Dietert*, president; *Earl E. Woodcliff*, chief engineer; *John A. Schuch*, spectroscopist.

Foxboro Company, Foxboro, Mass. Scale model of a Foxboro galvanometer suspension to demonstrate the operation of that part which is one of the most critical factors in determining the accuracy of the potentiometer pyrometer. New portable potentiometer pyrometer; also three newly developed instruments. Three types of potentiometer controllers: the intermittent, the throttling and the Stabilog, and a number of gauges, thermometers, etc.

In attendance: *S. C. Horn, E. S. Lawson, C. E. Hellenberg, M. A. Schreiner, A. H. Shafer, Wm. C. Morgan* and *H. L. Lee*.

Illinois Testing Laboratories, Inc., 420 N. LaSalle St., Chicago, Ill. "Alnor", portable and wall type pyrometers; distant reading electric thermometers; "Alnor" controller; a new shock resisting pyrometer; surface pyrometers; air velocity instruments.

In attendance: *D. L. Humm, Calvin A. Hooker, M. D. Pugh, E. F. Burke, J. A. Obermaier*.

Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa. Micromax pneumatic control for temperatures; Micromax electric control for average or "tough" jobs; Micromax-Rayotube recording for special temperature problems; also Micromax recorders, manual temperature indicators and portable temperature instruments. The furnace section will include Homocarb furnace, Homo tempering furnace and Vapocarb-Hump hardening furnace.

The Partlow Corp., 2 Campion Rd., New Hartford, N. Y. Temperature control instruments, safety valves and gas burning equipment; new safety pilot in operation.

In attendance: *Howard W. Partlow*,

president; *Howard W. Partlow, Jr.*, vice-president; *Alvin M. Stock*, vice-president; *James K. Clark, Oliver Stirling.*

Pyrometer Instrument Co., 103 Lafayette St., New York. Pyro Optical, Bi-Optical, Micro-Optical, Radiation, Immersion, Surface and Contact pyrometers as well as radiation tubes. Bi-Optical and Micro-Optical pyrometers are new instruments.

George Scherr Co., 128 Lafayette St., New York. Busch Metaphot, a new universal microscope; a complete line of optical and other precision measuring and inspection equipment including instruments for measuring and gauging lengths, diameters, etc., measuring and checking angles and angular divisions; measuring, gauging and inspection instruments.

In attendance: *George Scherr*, president, *Mr. Guellich*, Metallurgist and *George M. Kaner*, service engineer.

C. J. Tagliabue Mfg. Co., Park & Nostrand Aves., Brooklyn, N. Y. Superspeed Celectray recording pyrometer, in operation, taking six temperature records in 30 seconds; indicating type Celectray pyrometer; new line of Tag pressure spring instruments, recording thermometers and pressure gages; other instruments including oil testing, etched stem thermometers, hydrometers, etc.

In attendance: *E. D. Wacker, A. F. Rucks, C. O. Fairchild, L. Van Blerkom and Messrs. Kerr, Anderson, Frock, Hurst and Hix.*

Wheelco Instruments Co., 1931 S. Halstead St., Chicago, Ill. Several different kinds of controlling instruments in operation. "Flame-otrol" safety gas fired units; pyrometers, resistance thermometers, potentiometers, etc.

In attendance: *Leo W. Wheeler*, president; *R. A. Schoenfeld*, sales manager; *T. A. Cohen*, chief engineer; *J. A. Harrison*, and *C. H. Joy*.

Carl Zeiss, Inc., 485 Fifth Ave., New York. Metallograph Neophot for bright field, dark field and polarized light observation of metal specimens at all suitable magnifications. Spectrograph. Qu 24 for the quantitative and qualitative analysis of metals in the industrial laboratories; Pulfrich photometer for metal analysis; fine measuring instruments for the inspection of tools.

Die Castings and Modern Finishes Bring Lawn Mowers Up to Date

Modernization in design, style and finish has come to that staid utilitarian implement—the lawn mower. The precision Lawn Mower, built by Clemson Bros. Inc., Middletown, N. Y., is offered as the last word in an up-to-date tool using modern metals and modern finishes.

The construction is unique. Like no other mower, this grass-cutting machine is made entirely of steel and die castings (except for the roller which is of hard Rock Maple). The handles are made of steel tubing, welded into one piece with a comfortable chromium plated grip. The wheels, gear housings and fourteen other parts are made of zinc base die casting alloy, produced true to size and ready for assembly without machining operations, providing a finish and appearance which cannot be matched at comparable cost by other methods. Other parts are hardened steel. Roller, ball and oilless bearings are used throughout, eliminating oil holes and grease cups. No lubrication is required during the life of the mower.

Die castings in the modern lawnmower

The finishes used are also unique for lawn mowers, although simple in principle. Chromium plate is used on the knurled knob used for adjusting the bed-knife, on the roller adjustment lugs, the 1¾" tie tube, and the name designs on the wheels. The handle, wheels and the gear housings are finished in baked yellow enamel. The bed-knife, bed-knife adjusting shaft and reel assembly are finished in baked silver enamel.

All chromium plated parts carry the same weight of plate as is used in the highest grade automobile work, and are guaranteed to pass a ten-hour salt spray test. The baked finishes are applied in the same fashion as the standard automobile body finishes.

The Clemson precision lawn mower is a striking example of the trend in modern tools, toward the greater use of die castings, and plated and baked enamel finishes.

Adherence of Organic Coatings To Metals

By A. E. Schuh*

Bell Telephone Laboratories, New York

A survey of several types of organic coatings on metals to indicate the complexity of interrelated factors that influence the adherence of such coatings. It is only in rare cases, usually those of gross negligence, as in improper cleaning, use of excess finish, etc., that a single simple cause may explain a given case of poor adherence. In most other cases, faulty adherence is attributable to complicated causes which frequently are not related to the initial strength of adhesional bond. The coating material may have degraded to such a point of weakness and brittleness that a slight impact or other external stress causes it to fall off. In other instances, a new and weakly coherent interface may have developed as a result of high moisture permeability and thus destroyed the adherence of the finish. Finally, with thick coatings, sufficient internal stresses may have developed in certain coatings that even the best adhesional bond is overcome and as a result poor adherence of the finish produced.

*Abstract of a Paper presented at the Annual Meeting of the A.S.T.M., June 27-July 1, 1938.

Manufacturing High Grade Brass and Bronze Valves and Fittings

Careful control and automatic equipment combine to maintain quality and high production.

By FRANCIS A. WESTBROOK
Mechanical Engineer

THE Walworth Company has for many years manufactured a line of brass and bronze valves and fittings, in which a very high standard of quality has been maintained, and which has been progressively improved whenever advances in the art have made this possible. This maintenance of quality has been based largely on technical research, the most carefully equipped plants and well-trained personnel.

Testing, Research and Development

The Company has very complete physical testing and chemical laboratories in its Greensburg, Pennsylvania plant and also smaller but nevertheless completely equipped metallurgical laboratories in all their other plants for handling those problems of development and control which are of a more local character. Valves and fittings play a most important part nowadays in many of the process industries, especially as there is a constant tendency to go to extremes of temperatures and pressures. Unless the designing engineers and metallurgists know the behavior of their materials under all such conditions, they cannot turn out a good product at reasonable cost. Thus, such tests as the creep of metals at high temperatures, the effect of heat treatment, the effect of varying composition, etc., are always being made.

Then there is always the need for developing new types of products to meet new needs to reduce costs, etc. The most interesting of the new developments are the threadless bronze valves and pipe fittings, known to the trade as "Walseal Threadless Valves and Fittings". With these, a brazing alloy is incorporated in the form of a ring in a groove in the fitting. The properly cleaned and fluxed end of the pipe is inserted in the opening and an oxyacetylene torch applied. The result is a tighter and more permanent joint than the screwed joint and one which can be made very quickly and economically. Copper and brass pipe and tubing are thus being securely joined to bronze valves and fittings absolutely free from the possibility of leakage. The production of these items calls for very accurate and carefully controlled finishing operations.

Pattern Shop and Foundry

Great accuracy in patterns and cores is necessary in order to reduce subsequent machining costs and to insure the quality of the output. All master patterns are made of wood and master core boxes of plaster. Many of the patterns for large production are of aluminum which is used because of its light weight, especially since as many as 60 patterns may be mounted on one plate. Cast iron is used for other patterns where the quantity produced is small or where only a few patterns are mounted on a plate.

The core shop has a very compact arrangement so that the amount of manual handling is reduced to a minimum. The foundry is very carefully managed as the quality of the finished products depends very largely on what happens here. To this end there is a sand testing laboratory, equipped with up-to-date sand control equipment, for testing strength, moisture and permeability. Pouring temperatures are checked by pyrometer.

The foundry melting equipment consists of six 700 lb. melting furnaces. An important piece of equipment is a molding sand conditioner. Tabor molding machines are utilized for those parts which are cast in large quantities. The foundry is provided with an elaborate exhaust system whereby the air is kept clean and in good condition. The whole foundry is kept very clean at all times, which

Core making department, Walworth Company

as a part of good working conditions, is considered an essential prerequisite to the high standards of quality which are lived up to. The castings produced here vary in size, from ¼ oz. to 25 lbs. on regular work.

Cleaning Department

All castings are transferred down a chute from the foundry to the cleaning department on a lower floor. Shakers for core removal are located at the end of this chute. Sprue cutting is done here on standard sprue cutting presses. Fittings are cleaned in rotary sand blast machines. The valves are hand sand blasted. This is followed by snagging. Before machining, all castings are given an acid dip for cleaning. Roller conveyors are placed at the most convenient height so the castings in pans may readily be moved from one operation to another with a minimum of time and effort.

Testing the Casting

Before any machining is done, every casting is visually inspected by experienced operators and the rough castings are air tested under water for possible leaks. In addition to this a coupon and test bar are taken from every pouring sent to the laboratory, the former for chemical analysis and the latter for physical tests. The foundry foreman gets complete reports of all the tests and inspections so he has continual information on the quality of castings he is turning out and can control the operations for which he is responsible.

Machining Operations

Tapping of threaded valves and fittings is done on a group of automatic tapping machines. These are placed so one man can tend several machines and they are synchronized as to rates of production in accordance with the time required to tap the different products going through each, so that the operator may load and unload one machine after another in sequence. His work is facilitated by roller conveyors strategically placed. One operator goes the rounds, checking the taps and machines to make sure that everything is functioning properly, and an inspector gauges pieces coming from each machine for accuracy of threads. There is also a "squareness" testing table for checking threaded fittings to make certain that the threads will permit of making accurate 90 deg. or 45 deg. angles. These threading operations of course do not apply to the Walseal Threadless Fittings, but the reamed holes into which the pipes are inserted for brazing are very carefully machined and tested for squareness.

Three types of tapping machines are in use. The multiple head machines which are operated as just described, are used for fittings with holes to be tapped from ⅛" pipe size up to and including 2" pipe size. The rate of production is high, being from 4500 to 6000 per day per man, depending on the size. The 4", 5" and 6" fittings are tapped on vertical tapping machines. By using different jaws for the different sizes and angles all of the tapping on a fitting can be done with one loading. The large sizes from 2½" up where the quantities are comparatively small, are handled on a multiple spindle tapping machine, at a rate of 35 to 40 per hour per man.

The brass check nuts are finished on a five-chuck tapping machine, using air chucks. They are made complete in one loading of the machine by having three tools for machining the sides, plus a drill and a tap to make the threads.

The bonnets for the valves are made on the same kind of a machine. The edges are finished on a hex miller with an automatic device for quick and accurate loading. These bonnets are then taken to a turret lathe for undercutting the flanges, boring and threading, and forming the stuffing box end, all in one loading. This completes the bonnets.

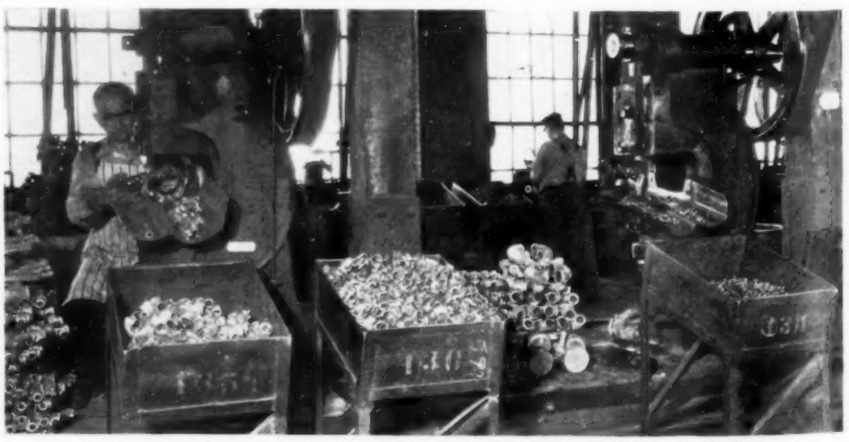
Double disc grinders are used for grinding the valve stuffing nuts, for those sizes which are too large (above 1") to finish on the semi-automatic machine used for the check nuts, already mentioned. The nuts finished on the double disc grinder are held in fixtures taking fifteen nuts. Two sides are ground at a time.

Valve discs are drilled and tapped in a semi-automatic machine similar to that used for the check nuts, at a rate of about 320 per hour per man. The slots are then milled with a disc miller at the high rate of 800 per hour. The discs are then finished on a regulation seat finishing machine with a high speed steel tool at an average rate of about 100 per hour.

The bodies of the valves are drilled and tapped for the pipe connections on a double end drilling and tapping machine. The four operations are done at once, two from each end. The bonnet ends of the valve are machined in one loading on a semi-automatic chucking machine. This consists of drilling and tapping for the bonnet, under-cutting the rim and facing rim. The production on this machine runs about 540 per hour. The last operation on the body consists of facing the seat for the disc, which is done on a small lathe.

Valve stems have their ends machined on turret lathes. Each end is done separately, two tools being used for one end and three for the other. The ends are milled square on a machine designed here at the rate of approximately 500 per hour.

The operations for producing the



Cutting the sprues from valves and fittings

Testing the fittings by air

Walseal Threadless Fittings are quite simple from the machining standpoint. The principle machining operation which takes the place of threading is reaming and grooving the inner surface for the Sil-Fos brazing compound. This is done on a specially designed upright drill in which the work is held in a chuck which can be turned so as to do one end of the fitting and then the other without reloading. That is, the reaming and grooving of both ends is done with one loading. The rate of production is very high. Every piece must be gauged, as the permissible tolerances are only 2 to 4 thousandths of an inch.

Valves are assembled at the assembly benches and are tested with compressed air under water and also by applying water at a high pressure inside of the valves, and fittings, to duplicate service conditions. Polishing of the parts is carried out with great care. They are polished on cloth wheels with 120 emery, which is followed with an application of a cotton wheel and composition.

The last mechanical operation is to put the wheels on the valves with the help of a machine which tightens the nuts, trims and burnishes the ends. The finished products are then ready for packing and shipping.

Soil-Corrosion Specimens

An exhibit of soil-corrosion specimens has been arranged in the Industrial Building of the National Bureau of Standards, Washington, D. C. These specimens which were removed from the ground in 1937 include two varieties of copper, several varieties of brass and bronze, soldered joints and brazed joints.

Those manufacturers interested in making detailed studies of these specimens can make arrangements in advance by communicating with *K. H. Logan*, Room 207, East Building, National Bureau of Standards, Washington, D. C.

Plating for Heat Treating

In a recent meeting held jointly by the Springfield chapter of the American Society for Metals and the Springfield Branch of the American Electro-Platers' Society, *George B. Hogaboom* of the Hanson-Van Winkle-Munning Co., Matawan, N. J., spoke on metal coatings, with special emphasis on the industrial applications, such as the fabrication and heat treatment of metals. One of the uses which the speaker described was the plating of metals to prevent carburizing and nitriding and to prevent excessive scale in the heat treatment of steel parts. He also discussed the replacement of worn metal and the filling of cavities by electroplating. Industrial applications for electrodeposition have become a very interesting field.

Industrial Uses for Silver

The American Silver Producers' Research Project to help find new industrial uses for silver was extended for a second year dating from June 1, 1938. Reorganization of the project and its staff to meet the changed conditions has now been completed. Work in the fields which seem most promising is being conducted along the lines of electrical contacts, bearings, coatings, alloys and fungicides.

A limited number of the copies of the Sixth Progress Report of this project is available upon request. Address inquiries to *A. J. Dornblatt*, senior research associate, American Silver Producers' Research Project, National Bureau of Standards, Washington, D. C.

Turning Brass Plugs

Q.—Kindly give us complete information concerning the turning of brass plugs such as are used in the manufacture of gas cocks. These brass plugs are to be of approximately 81% copper composition and are to be given a rough cut before arriving for finishing. In requesting complete information we would like your recommendations as to the kind of tool you would suggest for such work whether it be high-speed, Carboloy, or diamond, the maximum depth of cut you would recommend for the finish cut, and the speed and feed to do the work. Information on the actual grind and angle suggested for the tools to be used will also be appreciated.

A.—The turning of plugs of this type should be done with a single point tool in order to obtain maximum roundness of the plug.

The tool should have a rake angle of 90° and the cutting edge should be rounded rather than a sharp point.

Carboloy or diamond would be very good but high speed is not recommended where a high finish is desired; its greatest use is where high machining temperatures are encountered. A high carbon tool steel will produce as good a job as any, but it may dull a little quicker. It must be remembered that any scratch in the tool will be reproduced in the work and for this reason the tools should be honed after grinding.

The turning speed of the work should be as fast as possible without causing the work to get hot and the feed should be rather slow. No definite speeds can be given as they depend upon the diameter of the plug and the cutting properties of the metal and must be found by trial. About .015 in. is as heavy a cut as should be taken.—H. M. St. John.

Methods of Joining Copper Alloy Products. Conclusion: Sheets

Welding methods have become vitally necessary (a) as an element in facilitating design, (b) as an economical manufacturing method, (c) as an aid to good service performance and (d) as a convenient means of making repairs. Examples are taken and analyzed to help the designer, shop superintendent and welding operator to a better understanding of the problems involved.*

By I. T. HOOK

Research Engineer, The American Brass Company, Waterbury, Connecticut

Silicon Red Brass 1029

This sheet brass, a comparatively new commercial alloy, differs from the usual red brass in that it carries about 1% of silicon. The effect of this alloying element is (a) to improve the strength, (b) depress the electrical and thermal conductivities and thereby (c) improve the resistance weldability.

The optimum method of joining this alloy would be by the use of a resistance spot or seam welding machine. The current values required would be slightly greater than those required for steel and the pressures maintained at a constant value slightly lower than those commonly employed for steel of the same thickness.

The *silicon red brass* may also be oxy-acetylene fusion welded using strips of the base metal as welding rod or a yellow bronze welding rod, such as Tobin or Manganese bronze, for this purpose. It can also be silver soldered or soft soldered though it has no advantage over the straight copper-zinc red brass for such purposes.

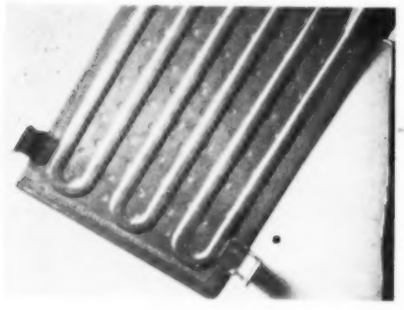


Figure 24. Part of a resistance welded refrigerator evaporator made of .044" thick silicon red brass sheet. The seam welds must remain gas tight under pressure. (Courtesy Westinghouse E. & M. Co.)

It is not weldable by the metal arc but, in cases where an exact color match is not required, it can be readily welded by the carbon arc and "Everdur Silicon Bronze" welding rod observing the precautions outlined above for keeping the arc from direct contact with the base metal.

"Everdur Silicon Bronze"

As will be observed from Table 6, "*Everdur Silicon Bronze*" is given the highest weldability rating of any of the copper alloys. The reasons for this are in part obvious. It has a low thermal and electrical conductivity so that excessively high heat intensities are not required; it has excellent ductility at all temperatures from room temperatures to within a comparatively few degrees of its melting point and in all fusion welds, it is protected from atmospheric oxygen and the torch or arc gases by an impervious, continuous, silica glass film formed largely from the elements in the fused metal itself.

None of the more common alloying elements, copper, silicon and manganese, are volatilized at the usual welding temperatures. Hence the metal flows freely under its liquid film of silica glass the added "Everdur Silicon Bronze" metal joining the fused base metal freely and completely.

The only word of *caution* needed in making an oxy-acetylene fusion weld is that the operator must be sure that the base metal is fused when the added metal from the "Everdur Silicon Bronze" welding rod is flowed into place. The molten metal from the "Everdur Silicon Bronze" welding rod will "tin" the hot, solid "Everdur Silicon Bronze" freely as does molten Tobin bronze on red hot steel. Unlike the latter, which develops a high strength in the bond even though the base metal is not fused, the "Everdur Silicon Bronze" weld metal will have only an indifferent strength of bond to the "Everdur Silicon Bronze" base metal unless the latter is fused simultaneously with the addition of the molten weld metal.

In carbon or metallic arc welding, there is no difficulty on this score. The high intensity of the arc temperature readily fuses both rod and base metal at the same instant.

Oxy-acetylene welds may be made as free welds or the sheets rigidly tacked together. Usually the welds are made without a backer though this method calls for a high degree of skill in the operator. A backer of asbestos, carbon or thin, black steel can be employed to advantage in some cases. A slightly oxidizing flame is preferred to a strictly neutral flame.

Carbon and metallic arc welds are almost invariably made as rigid welds, the two edges being securely tack welded together before the seam is started. A copper backer such as that illustrated in Figures 18 or 19 is very often used in making the first pass of a carbon or metal arc weld. In welding thick sheets by the carbon arc, a skillful operator will often prefer to

* Parts 1, 2, 3, 4, 5, 6, 7 and 8 were published in our issues for Sept., Oct., Nov., 1937, Jan., April, June, August and September, 1938.—Ed.

run the first pass without the use of a backer, placing the edges somewhat closer for this purpose.

The evaporator of Figure 25 is made up of "Everdur Silicon Bronze" sheet carbon arc welded throughout except for shell of the steam chest which is made of steel. The chemical is thus contained in a circuit made up entirely of "Everdur Silicon Bronze"

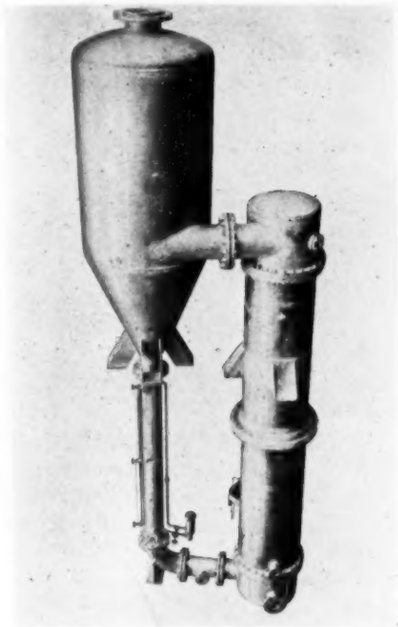


Figure 25. Part of a high-velocity evaporator. Carbon arc welded "Everdur Silicon Bronze." (Courtesy Struthers-Wells Co.)

and deoxidized copper. The difference in longitudinal expansion, caused by heating, between the bank of copper tubes in the steam chest and the steel shell is taken care of by a copper expansion joint welded into the mid girth of the steam chest.

The vessel of Figure 26 is a familiar type of hot water storage heater used to supply clean, hot water for laundries, hotels and apartments. This vessel was metallic arc welded using 5/32" diameter bare "Everdur Silicon Bronze" welding wires. Many similar vessels have been welded by the carbon arc and also by the oxy-acetylene blowpipe.

"Everdur Silicon Bronze" shows excellent response to resistance spot and seam welding methods. Its low thermal and electrical conductivities makes the metal weldable by the spot welding machines commonly used for steel though the pressures desired are usually lighter. Cold rolled "Everdur Silicon Bronze" sheet can be seam welded without complete loss of the cold work hardness.

Nickel Silver, Ambrac and Super Nickel

These three metals are the only metals white in color listed in Table 6. The principal difference in composition between them is that the nickel silver has zinc in proportions approximating 25%, the Ambrac has only 5% while the Super Nickel is free of zinc having approximately 70% copper and 30% nickel.

Thus the welding characteristics of nickel silver are not unlike those of brass with two exceptions—(a) the nickel content depresses the electrical and thermal conductivity thus making the nickel silvers easier to weld by resistance methods and (b) precautions must be taken to avoid formation of nickel oxide.

Equipment make up of nickel silver is often silver brazed in which case the silver soldered joint can usually be made quite inconspicuous as for instance the trace of a butt weld or a mitered joint showing as a faint hair line on the face of the finished work. While not an exact color match, the silver solder is sufficiently close in color to that of the nickel silver as to be inconspicuous.

Oxy-acetylene fusion welds offer perhaps the next best method of joining nickel silver. Nickel silver welding rod or strips of the base metal can be used as filler metal. Owing to the lower heat conductivity of the metal, a slightly lower intensity of flame is required than would be used with an equal thickness of brass.

As in welding operations on all nickel alloys, steps must be taken to prevent the formation of nickel oxide. Thus the work should be covered with flux before the heat is applied and once heated, the torch flame should be held continuously on the metal until the weld is complete. A strictly neutral flame should be used, as an excess of oxygen would develop difficulties from nickel oxide and excess acetylene would increase the danger of porosity from dissolved hydrogen.

The nickel silvers are not commonly welded by the carbon arc and the zinc content inhibits the use of the metallic arc. They are readily bronze welded with Tobin Bronze where the color contrast is not objectionable.

As will be noted from Table 6, all of the nickel alloys are given an "A" rating in resistance spot and seam welding.

Ambrac acts much the same as nickel silver in brazing and welding operations except that with its very low zinc content, it is occasionally metallic arc welded with an ambrac electrode.

Super Nickel is given a higher rating in oxy-acetylene and metallic arc welding as special welding rods and covered electrodes and the absence of zinc facilitates these operations.

Phosphor Bronzes

While easily bronze welded with the high zinc bronzes, the phosphor bronze metals are not as easily fusion welded with the oxy-acetylene torch and a phosphor bronze welding rod. The metals are decidedly hot short and it is difficult to avoid cracking while the metal is solidifying from its molten state.

With the more concentrated heat and faster melting and solidifying obtainable with the carbon arc, less difficulty with hot short cracks is encountered. Hence the carbon arc becomes the optimum method of welding the phosphor bronzes. The metallic arc is also employed to a limited extent. The use of covered phosphor bronze, metallic arc wires appears to be on the increase.

Phosphor bronze has excellent electrical and physical characteristics for resistance spot and seam welding except for the fact that it is prone to

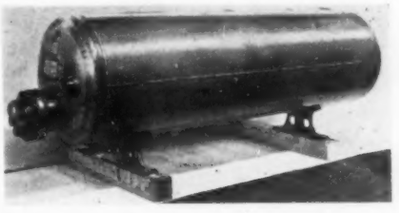


Figure 26. Five hundred gallon "Everdur Silicon Bronze" hot water storage tank. Metallic arc welded. (Courtesy Whitlock Coil Pipe Co.)

stick to the welding electrodes. This means bad spots on the work and constant redressing of the electrodes. The reason for this is that the high temperature of the spot weld causes a slight vaporization of the phosphorus which deoxidizes the surfaces in contact with the electrodes causing "sticking" to take place.

Phosphor bronze, when molten, welds readily to steel, galvanized steel and cast iron. Thus wear resisting surfaces are often built up by deposits made by the carbon and the metallic arc.

Ambraloy 901, Beryllium Copper

These two alloys are grouped together, not from any physical or metallurgical similarity, but rather because the oxides of aluminum and beryllium which are formed in welding operations make them quite similar in their welding characteristics. These oxides make oxy-acetylene welds difficult, the beryllium oxide being so refractory and unfluxible as to make oxy-acetylene welding of beryllium copper impossible at this time.

The Ambraloy, which is a 5% aluminum bronze, can be welded by the oxy-acetylene torch when precautions are taken to avoid formation of aluminum oxide which isn't particularly bad with this proportion of aluminum.

Both of these alloys are readily resistance spot and seam welded and this is the optimum welding method for thin sheets. For thicker sheets and deposits of these metals on copper or steel, the carbon arc furnishes the most favored welding method. With the rapid action of the carbon arc, the metal fuses and runs together before the film of aluminum or beryllium oxide forms in sufficient amount to interfere. Sound, strong welds are obtainable in this manner. If subsequently heat treated, carbon arc welds in beryllium copper will develop strengths up to 150,000 pounds per square inch.

Dull, Brittle Nickel

Q.—Will you kindly let me know what is wrong with this nickel solution?

When plating I usually get a dull finish and it comes out brittle when it is in solution too long.

A.—The nickel solution analyzes:

Nickel	2.87 ozs./gal.
Chloride as amm. chloride	.41 oz./gal.
pH	6.8

The chloride is low and the pH is much too high.

To correct the pH add 14 ozs. of sulphuric acid to each 100 gals of solution. Add over a period of a few days. To bring up the chloride add 2.5 ozs./gal. of ammonium chloride.

Correction of the pH should eliminate your difficulties. If brittle nickel continues look for copper or zinc impurities or excess cadmium or other brightener.—G. B. H., Jr.

Pitted Nickel

Q.—Please analyze our solution as I am having trouble with pitting. It seems that little bubbles form on the work causing the pitting. I have tried an anti-pitting agent and don't seem to get any results. I have recently added boric acid and ammonium chloride. Can you tell me why some platers use sodium chloride?

A.—The analysis of your solution is:

Nickel	3.13 ozs./gal.
Chloride as amm. chloride,	1.86 ozs./gal.
pH	6.3

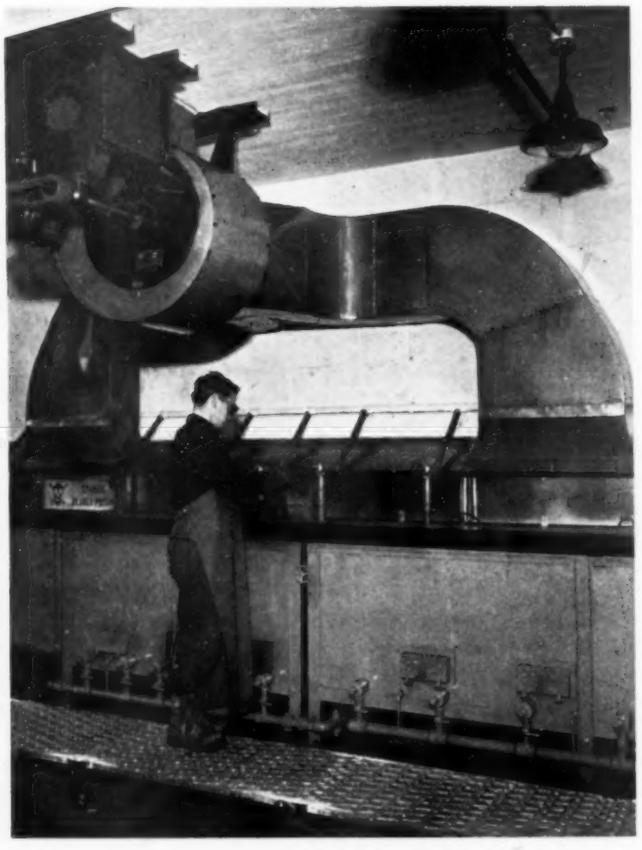
The chloride can be increased to 3 ozs./gal. The pH is slightly high. Addition of 3 fluid ounces of sulphuric acid to each 100 gals. of solution will bring pH to approximately 5.8.

Pitting can be prevented by adding hydrogen peroxide, about 1 pint of 100 vol. peroxide to each 100 gals. of solution.

Wetting agents (anti-pitting) should prevent pitting. You may not have a sufficient concentration in the solution. A simple test for the correct amount is to note if a slight foaming occurs on the surface of the solution during the plating. No foam indicates not enough agent. Excessive agents must be avoided. For exact method to use wetting agent consult supplier of same.

Either sodium, ammonium, or nickel chloride may be used to supply chloride content. The latter is necessary in hot nickel solutions. For room temperature nickel solution either sodium or ammonium chloride may be used, but preferably the latter. Sodium chloride tends to produce a harder nickel because the sodium ion, as it discharges at the cathode, produces a more alkaline film than the ammonium ion. The more alkaline film precipitates nickel hydroxide and inclusion of this precipitate in the deposit causes brittleness.—G. B. H., Jr.

A Modern Stripping Tank



The finish stripping tank in the Plating Department installed at the Brooklyn Distributing House of the Western Electric Company started early in 1937. This up-to-date installation features acid-proof mastic floor, steel grating platform, and hoods and fan made from "Inconel" and Monel metal. The intake blower forces fresh air through a manifold along the top front edge of the tanks and blows fumes and gases across the tanks toward the exhaust hood, which handles 6,000 cu. ft. of air a minute.

New Method of Plating on Aluminum

Pre-treatment, producing a modified anodic film, gives a surface to which electrodeposition adheres firmly.

By WILLIAM J. TRAVERS

Krome-Alume, Inc., Lockport, N. Y.

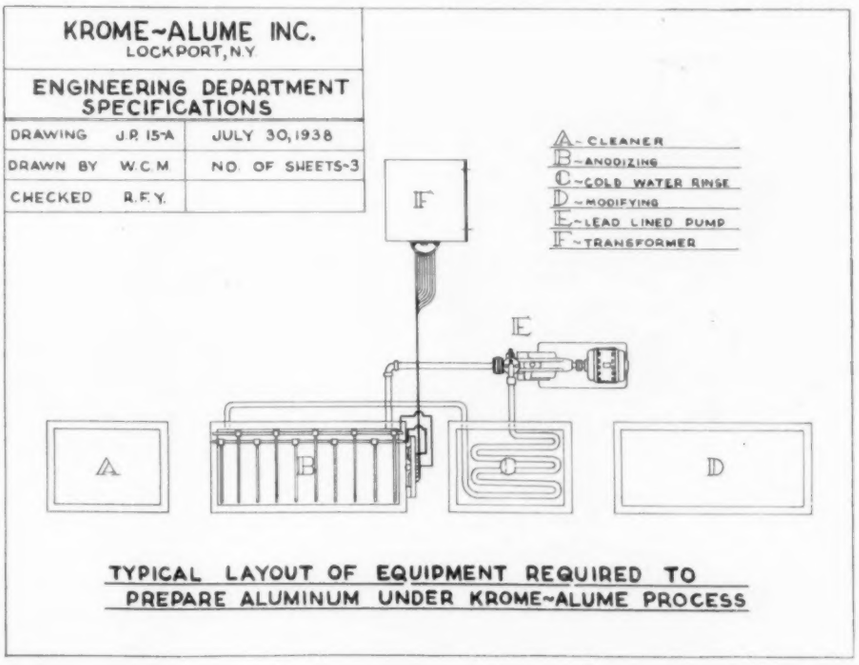
IT HAS long been assumed that to successfully plate aluminum, one must initiate the process by removing the last vestige of the oxide film. While this could be done chemically, the problem of preserving this virgin surface during the plating process has been insurmountable. Hence, most plating on this highly active metal has been anchored mechanically by a pre-plating etching process. The adhesive qualities of such plating is naturally very poor and the process has never been accepted commercially.

Building an Oxide Film

It is rather paradoxical that a successful method of plating this heretofore stubborn metal has been predicated not on the elimination of the oxide film but rather on increasing it by electro-chemical treatment. In short, the plating process is initiated by the formation of a rather thick anodic surface or "skin" which is normally a poor conductor of current and exhibits pronounced "unilateral" properties. By this it is meant that the film will permit the passage of current in one direction but offers almost infinite resistance in the opposite direction. When properly exposed to certain chemical treatment, this anodic film is so modified that electrochemical anchorage of plated metals thereafter becomes possible. Moreover, for some reason still not thoroughly understood, this plating demonstrates an unusually high degree of adhesion under salt spray, widespread fluctuations in temperature, abrasion, etc.

The term "oxide film" means, in this instance, that film which is always formed on an aluminum surface when it is exposed to any reacting agent, but is commonly restricted to the film formed by immersion in aqueous solutions. It is not surprising therefore, that most of the previous investigators of the problem put particular emphasis on the removal of the oxide film. Coupled with the attempts to remove this film was the evident result that, due to the high position of aluminum in the electro-motive series, the elimination of this oxide film, where it was possible, would, upon immersion of such an oxide-free surface in an electrolyte, cause the formation of an immersion layer of metal on the aluminum surface. Like most immersion layers so produced, however, it had little or no adhesion so that defeat was practically certain. In attempting to reconcile these difficulties, resort was made to various solutions of halogen derivates, which not only form soluble aluminum compounds, but also had a definite etching action on the aluminum surface. Inasmuch as it is highly desirable to form deposits on a smooth surface, it is self-evident that any etching action will tend to defeat that purpose.

In the process which is the subject of this article, not only is there no effort made to prevent the formation of the ordinary oxide film, but a substantial film of the anodic type is purposely formed on an aluminum surface. This process is based on the discovery that an anodically treated surface of aluminum, which is subsequently subjected to a chemical reduction or modifying action, as it may be termed, is susceptible to receiving a very adherent and quite impervious electro-deposit. The anodic film may be formed on the aluminum surface in a variety of electrolytes, both acid and alkaline, but more uniform results have been obtained by using solutions of dibasic organic acids of which oxalic is an example. Some electrolytes are naturally more suitable than others due to better solubility, better conductivity and less chemical reaction with the aluminum. These anodizing electrolytes are generally used at temperatures of about 70° F. They tend to rise in temperatures when in use,



TYPICAL LAYOUT OF EQUIPMENT REQUIRED TO PREPARE ALUMINUM UNDER KROME-ALUME PROCESS

due to the ohmic resistance, and means must be provided to maintain temperature uniformity.

The exact nature of the anodic film formed on an aluminum surface has not been determined, but there is some reason to believe that it is rather complicated and is made up of a hydrated oxide together with a gaseous component. Moreover it is very probable that the nature of the film varies somewhat with the type of electrolyte in which it is formed and also perhaps with the electric current employed in its formation, whether direct or alternate.

The Travers Process Practice

In the practical working of this process alternating current is generally used because of its freedom from polarizing effects and the greater facility with which it can be obtained, as well as the simplicity of voltage regulation. The voltages usually employed vary from 20 to 50, the lower range being used for castings and the higher for aluminum of greater purity. It may be noted in passing that the silicon alloys react like the grade of aluminum commonly designated as 2S. The anodic film will form on both cast and sheet aluminum articles, but the characteristics will vary.

In practice, the aluminum article is first given a high polish and then degreased in some mild cleaner; even a cold solution of sodium cyanide has given good results, the article remaining in this until clean. The solvent action of the solution does cause a certain amount of action on the aluminum itself, but this has been found not unduly detrimental. It has been found that some of the special cleaners designed for aluminum, especially those containing an inhibitor of the silicate type, usually form a coating on the aluminum surface which must be removed before a satisfactory anodic coating will form.

The special transformer used with the Travers process. Current for the establishment of the anodic film is supplied by a primary tapped off in 5-volt steps from 5 to 50. Job platers use transformers rated between 10 to 15 kilowatts.

A typical Travers installation in the plant of the Eastman Kodak Company, at Rochester, N. Y. Die-cast aluminum camera cases are plated with the equipment.

After cleaning, the aluminum article is placed in the anodizing electrolyte. A number of similar pieces are so disposed in the tank (usually parallel) so that each article serves as a counter-electrode for those adjacent to it. With the use of alternating current, this arrangement makes it possible for each article (even when a considerable number are processed at one time) to receive its proportional share of the current. The usual time required to secure a suitable anodic film is about ten minutes. Of course, it is well known that as the film builds up on the aluminum surface, a retardation of the current flow takes place, and the film growth becomes slower unless the impressed voltage is increased.

After the aluminum article has been provided with a suitable anodic coating, there follows a period of immersion in a solution which has a solvent action on the film, this action being allowed to continue for a predetermined time. The "end-point" of this reaction can be determined by certain indicators and the change in appearance of the film itself. Once this has been determined by observation and the proper period of immersion learned, future timing on the same class of work can be controlled entirely by the clock. The prepared aluminum surface is then ready to be plated.

It has been found that the most satisfactory deposits for the initial coating is nickel. Other metals may be over plated on the nickel deposit without any particular difficulty. Bright nickel may be used if desired. In fact the process has been employed with all the commercially successful bright nickel baths and the result, by and large, is the same as that had with any of the common metals. On the whole, aluminum treated by the Travers process may thereafter be plated in the conventional routine like brass, iron, etc. Plating time is the same, the solutions, current densities, etc., all conforming to standard practice. The chemicals used in the pre-plating or preparation are of a very common nature and are usually found in any plating establishment.

The Process Is Not Critical

In applying the process commercially, it has been found that a plater of ordinariy intelligence may proceed to plate aluminum successfully after instruction that does not need to extend beyond a few hours. The treatment is not critical in any sense, although slight variations are recommended for the various aluminum alloys. This is especially true in that part of the treatment that involves a modification of the anodic film set up. The time factor here is controlled strictly by the nature of the alloy; that is, its chemical ingredients, its physical properties, hardness, porosity etc. The purer forms of aluminum require a longer time for modification than do the more heavily alloyed forms. Some of the latter receive sufficient anodic modification within a period of 38 seconds where the purer commercial forms of aluminum may require as much as 15 minutes. This is notably the case of 2S metal which is commercially pure aluminum. Chemically pure aluminum would require a still longer time, but there is little of this metal in commercial use.

It is pointed out that the Travers process is not precisely a method of plating aluminum, but rather a method of preparing aluminum to be

plated in commercial plating solutions.

Theories About the Anodic Film

While some theories have been propounded in connection with the action and result of the anodic modification treatment, there is really very little known about it. Perhaps the most likely theory is that the anodic modifier pierces the anodic film (normally a rather good dielectric) with millions of tiny holes thereby permitting the subsequent plating to anchor itself in the metal underneath. One plating authority claims that the oxide or anodic coating is "skeletonized"; that is, rendered partially porous. At any rate the resulting adhesion established between the aluminum and the plating is very satisfactory. With most of the aluminum base alloys, this adhesion is superior to that formed between the more commonly plated metals and their coatings.

Other Uses Besides Decoration

The process is finding uses that extend beyond pure decoration. When aluminum is provided with a coating of nickel and subsequently given a rather heavy application of chromium, its resistance to wear is greatly increased. It has also been found that aluminum "struck" with nickel may be soldered with ordinary solder and flux, a factor that is becoming increasingly important for fabrication purposes.

Re-Tinning Ladles

Q.—Having been a subscriber to your paper—METAL INDUSTRY for the past 20 years would much appreciate your views regarding the following. I am setting up a small retinning plant and expect to do a small ladle in racks; cleaning first, then pickling, then rough tinning, then into a tallow sweating bath, then to a clean tin kettle, then to a tallow finishing kettle, chill in palm oil and then to a paraffine distillate tank to cut the palm oil.

What I would like to know is at what temperature should the palm oil tank be? Also what temperature to use on the paraffine distillate? What grade of palm oil? What grade of paraffine distillate? I intend to heat the last two in a tank using steam coils. Would it be necessary to place racks on a hot plate after coming from tallow finishing kettle before quenching in palm oil?

A.—The best method of retinning small ladles is to place them in a rack and put them into what is known as a soaking kettle. This consists of grease, inedible tallow of prime quality. The temperature of the soaking grease is held at about 540 deg.F. The next step is to lift the rack out, drain it well of grease and lower it into the first tin pot, or rough tin pot.

The temperature of this tin bath is held about 520 deg.F. The grease which comes to the surface of the bath is lifted off and put back into the grease or soak pot. From the dirty tin or rough tin pot, the work is lifted out and put into a clean tin pot. The temperature of this tin bath is held at about 520 deg.F. also. For some work this tin bath is held at a higher temperature than the rough tin; for other work, lower; it depends upon the article. After taking from the cleaner tin bath, the rack is lowered into the clean grease pot. The temperature of this grease is held at about 485 to 495 deg.F. All new grease is added to the clean grease pot; not to the soaking grease pot. Grease for the soaking grease pot is skimmed from the tin baths and also taken from the clean grease pot when needed. The same thing is done with the tin; all new tin is added to the clean tin bath and any tin needed for the rough tin pot is dipped from the clean tin bath. The last step is to go to a list pot when the articles are large enough to have a distinct drip.

After thorough draining, the work is passed on to the cleaning and drying bench. This consists of a bin of fine cedar sawdust first. The worst of the grease remaining, is removed in this bin. The next step is to wipe well with whiting, and the final bin is filled with fine pine sawdust. The articles are then given a final wiping with a soft rag. This last wiping gives them a clear beautiful polish.

Palm oil is not recommended for this type of tinning. Much better results are obtained by using prime tallow. In some cases the work is given a dip in a high grade fuel oil, heated in a steel barrel with steam coils which are, of course, enclosed. The oil is removed in the manner described above, by first wiping in cedar sawdust, then whiting, and then fine pine sawdust, with a final polishing with soft cloths.

Palm oil is used for the purpose of keeping the tin coating molten securing a better distribution of coating, removal of excess tin and protecting the tin from oxidation and discoloration while cooling.

The temperature of the palm oil is very important and much care must be exercised in seeing that it does not go above 470 deg.F. A temperature of 460 to 465 deg.F only 10 to 15 deg. above the melting point of tin should be aimed at. If temperatures of over 470 deg.F. are reached, a yellow discoloration is likely to occur. Palm oil readily polymerizes if the oil gets too hot which results in poor work and high oil losses.

As a starting point in the use of palm oil it might be heated to 300 deg.F. The heat can be applied through an enclosed steam coil in the palm oil container. The work can be dipped in the oil for 2 to 3 minutes at which temperature and time in the oil, it should flow freely. On removing it may be necessary to set up an air blast to remove some of the oil.

The paraffine distillates are recovered at temperatures ranging from 338 deg.F. to 482 deg.F. The flash point of the lower products is about 230 deg.F. The flash point of paraffine distillate is slightly higher than this. The melting point of paraffine varies from 45 to 90 deg.C. (113 to 194 deg.F.) From these data and information a satisfactory working temperature between palm oil and paraffine distillate can be worked out best by actual practical trials. The size of article, weight and production put through these mediums will quickly show by a few practical tests at which temperatures they give best results.

Listing is for purpose of removing the last drop of tin that runs off. If there is no drip on any edges with the method of draining used, there will be no need of listing. If the articles are withdrawn slowly and drained properly, there should be no runoff drip on the edge. W. IMHOFF

Depositing Uniform Thicknesses of Metal for Plating to Specifications

Variation in thickness of deposits complicate plating to specifications. The fundamentals of current distribution. Practical considerations of equipment and operating conditions to produce uniform deposits.

By JOSEPH HAAS
Electrochemist

PLATING to thickness specifications is not new, although historically, it is of recent development. The first plating industries that made any attempt to control the quantity of electrodeposits, were the flatware and hollow-ware industries depositing silver. This was due to the fact that they were depositing a precious metal and over-deposits would have been expensive, and because the work called for a definite quantity of silver per gross of teaspoons, tablespoons or per sugar bowl, etc. The step from *quantity* of metal deposited to *thickness* is only one of degree.

Until quite recently the plating industry in general was conscious of neither quantity nor thickness. A plater referred to the quality of his plate as a one-hour nickel plate or a half-hour copper plate. The standards thus set were primarily determined by each plater himself; how long he had to plate articles, so that the buffers would not cut through the plate. The salt spray test gave the plater his first jolt. But here again the plater merely increased his time with no idea of the weight or thickness of plate.

Not until the National Bureau of Standards undertook to guide a series of experiments, sponsored by the American Electro-Platers' Society specifying definite thicknesses of deposited metal, did the plating industry as a whole face plating with thickness.

As yet, the commercial status of thickness specifications is still uncertain because there are few specifications and those few are not yet generally upheld. But they will eventually be insisted upon because the evidence to date points to the conclusions that the protective value of a good metallic coating increases with the thickness of the coating.

Difficulties in Depositing Predetermined Thicknesses

At first thought, the question of the thickness of a deposit does not appear to be difficult. But examination of plating literature fails to reveal much definite information on practical methods of depositing metals to thickness specifications, or agreement on what factors are favorable or unfavorable to obtaining such deposits rapidly and economically.

The problem is further complicated by the fact that the distribution of an electrodeposit is not uniform. At some point in a plating tank the deposit will be heavier than at other points and the deposit as a whole will be no better than that of the minimum thickness. If this minimum thickness happens to be the specified thickness, then in ordinary plating practice, much of the work area has been much overdeposited at a great increase in cost. *The problem in plating to a thickness specification is to deposit as evenly over the cathode area as possible and in the least possible time.*

This involves more than calculating areas, fixing current densities, placing the articles in the tank, and then waiting until the calculated time has elapsed. Such deposits will fall far behind the specifications.

In determining how to obtain deposits of uniform thickness, we soon find that those factors that are essential to control, to give us good electrodeposits,[1] are to a certain degree, also the factors we must take into account when trying to deposit uniform thickness. We must consider the action and influence of the applied electric current upon and in the solution and the properties and action of the various solutions under the influence of the electric current.

Mechanism of Conductance in Solutions

For illustration we refer to the action of a plating solution as shown in Fig. 1.

In "1A" we have the plating solu-

[1]Blum & Hogaboom: "Principles of Electroplating & Electroforming" 2nd edition pp. 85-119.

FIG 1

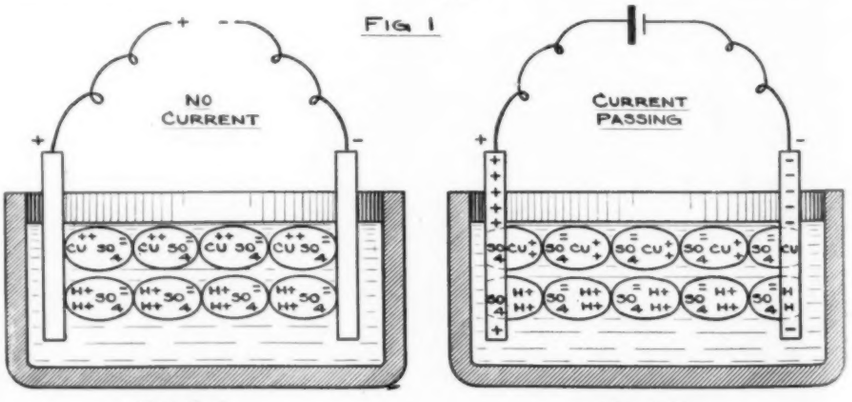


FIG 1 A. FIG 1 B.

SHOWING STATUS OF ELECTRODES AND IONS IN COPPER SULPHATE SOLUTION BEFORE AND AFTER PASSAGE OF ELECTRIC CURRENT

tion when no current is flowing through the solution. In "1B" we have the electric current flowing. This is described by stating that one electrode becomes charged with positive (+) electric charges and the other with negative (—) electric charges. Then because there exist in the solution positively and negatively charged ions, the positive ions are attracted and the negative ions are repelled by the negatively charged electrode, and the negative ions are attracted and the positive ions are repelled by the positively charged electrode.

Fundamentally such an explanation is correct, but it leaves much to the imagination, in that it does not throw any light on the so-called path of the current in traveling through the solution.

Every plater knows from experience that articles located at the ends of the tank receive heavier deposits than those located at the center of the tank. This is accounted for by stating that the current density is greater at these points. The same condition prevails at the bottom of the tank. He also knows that the anodes dissolve from the bottom up. The lightest or thinnest deposits are found in the middle center of the tank. If a plater fills his cathode rod with entirely flat work, so that all the articles are equally spaced, he observes that it is the edges that receive the first deposition of metal, and then gradually the entire surface becomes covered.

This practical evidence lead us to the conclusion that in solutions, the current does not move in a straight path between the anode and cathode, but it acts like a gas, as it tends to fill the entire volume of the solution or perhaps to make its influence felt through the entire volume.

For a visual representation of the passage of an electric current through a solution, we need only to refer to the effect produced when two magnets have their dissimilar poles placed near each other, and iron filings are sprinkled on a cardboard covering the magnets. Referring to Fig. 2 we have the magnetic field represented in "2A." An electric field of the same type is represented by "2B" in a plating solution.

Lukens[2], by means of exploratory electrodes showed very conclusively that the electric current *does not* pass in a straight line between the positive and negative electrodes. While Lukens has decided to call the field between electrodes "equipotential lines," the writer believes that in keeping with the term used to describe the field between dissimilar poles of magnets—namely the "magnetic field"—the term "electrical field" is more appropriately applied to an electrolyte charged with an electric current. Furthermore, Lukens clearly proved that the "electrical field" or "equipotential lines" are dependent upon the shape, form and size of the electrodes. Lukens might have gone further and shown that the shape of the containing vessel had an effect on the electric field. That he did not do so is immaterial, because his work on electrode shape together with practical experience proves that the shape of the containing vessel is a factor. It is evident therefore that in a plating solution the lines of force are influenced by the size and shape of the electrodes and their range may be altered and modified as shown in Fig. 3.

To influence these lines of force to distribute themselves more uniformly over the cathode area, is one of the problems of obtaining uniformly thick deposits. This problem exists whether the entire cathode is flat and equidistant between anode and cathode or whether parts of the cathode are nearer to the anode than are the other parts.

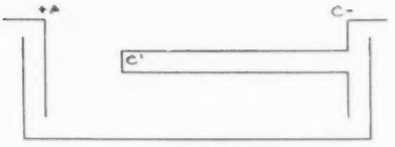


FIG 4
IRREGULAR SHAPED CATHODE

Blum & Hogaboom[3] have tried to show that the metal distribution on cathode surfaces of unequal distance from the anode are dependent upon a "primary current distribution," and a "secondary current distribution," dependent upon polarization. In view of Lukens' work and actual practice the writer feels that this theory is not the complete anwer.

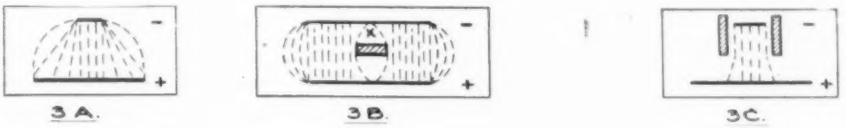


FIG 3

Modification of lines of force

Assume the following simple case, (see Fig. 4.)

Distance between A and C = 8″

Distance between A and C¹ = 2″

The solution is electrolyzed at 2 volts.

The resistance of $\frac{A\ C}{A\ C^1} = \frac{8}{2} = \frac{4}{1}$

Therefore, assuming these relative figures:

Resistance (R) for A to C = 4

Resistance (R^1) to A C^1 = 1

According to Ohm's Law, for A to C, we have:

$E = I\ R$, or

$2 = I \times 4 = 4\ I$

$I = \frac{4}{2} = \frac{1}{2}$

And also according to Ohm's Law, for A to C^1

$E = I\ R$

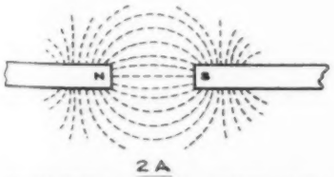
$2 = I \times 1$

$I = 2$

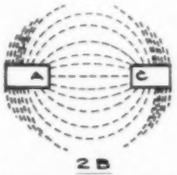
[2]Trans. Electrochem. Soc. Vol. 67 p. 320.

[3]Blum & Hogaboom—Principles of Electroplating & Electroforming, 2nd edition, pp. 110-115.

FIG 2



2A
MAGNETIC FIELD BETWEEN SIMILAR POLES OF TWO MAGNETS



2B
ELECTRIC FIELD BETWEEN ANODE AND CATHODE IN A PLATING SOLUTION

Since 2 is 4 times as great as ½, we have 4 times as many amperes at C^1 as we have at C. and since according to Faraday's Law, the amount of metal deposited is proportional to the current volume (amperes), the amount of metal deposited at C^1 should be 4 times as great as deposited at C.

In actual practice, however, this ratio will not be obtained because the electric lines of force are not evenly distributed through the bath. They will be more concentrated at the ends of the tank, at the bottom and at the top, and least through the body of the solution.

Composition of Solution or Electrolyte a Factor in Metal Distribution

Before the investigations of Haring and Blum[4] platers spoke vaguely of a mysterious property of solutions, that they called "throwing power." By this property they meant that certain solutions had the ability to deposit or "throw" metal into hollows, recesses and crevices. The factor of evenness of deposit was not considered. Although their definition was not perfect, Haring and Blum were the first to place a numerical value on throwing power. They defined it as a percentage improvement of the actual metal distribution ratio above the primary current ratio. (see Fig. 4). In their investigation, they determined that, as far as the solution was concerned, throwing power depended upon (1) the degree to which polarization increased, with increased current density; (2) the conductivity of the solution; (3) cathode efficiency at different current densities.

The work of Haring and Blum has been quite specific in regard to these factors and for the purpose of ready reference may be summarized, together with the practical experience of the writer as follows:

Increasing Current Density

Desirable Effects

1. Decrease size of crystals, giving hard and close grained deposit.
2. Increases rate of deposition.
3. Increases cathode polarization, thus improving throwing power. (Exceptions: copper sulphate and silver cyanide solution).

Undesirable Effects

1. Limited by the critical current density. The first undesirable effect will be a decrease in cathode efficiency, then the appearance of a burnt deposit, due to the impoverishment of metal ions in the cathode film.

Cathode Agitation or Motion[5]

Desirable Effects

1. Replenishes cathode film with metal ions.
2. Permits use of higher current density.

Undesirable Effects

1. Stirs up sediment. (This can be eliminated by using bagged anodes and continuous filtration.)
2. Decreases throwing power thereby resulting in less uniformly thick deposits. This defect may be counterbalanced by the uses of more concentrated solutions, conducting salts and higher current densities.
3. Improves throwing power of copper sulphate and silver cyanide solutions.

Continuous Filtration

Desirable Effects

1. Keeps solution clear of sediment and metallic particles.
2. Keeps solution of uniform density; replenishes cathode film with metal ions.
3. Does not reduce throwing power to the same degree as cathode agitation.

Increasing Temperature

Desirable Effects

1. Increases conductivity, thus permitting the use of higher current density.
2. Reduces tendency of hydrogen to cling to surface of cathode and particularly in the case of nickel, decreases tendency of absorption into deposit.
3. Aids more uniform distribution of cathode deposit, because of a more even distribution of electric field in the solution.

Undesirable Effects

1. Increases size of crystals of deposit giving a softer, open grain deposit. This condition, if undesirable, can be corrected by the use of higher current density or increasing metal ion concentration.
2. Decreases polarization thus affecting throwing power. This condition may be improved by addition of conducting salts, higher concentrations of solution or higher current density.

Use of Conducting Salts

Desirable Effects

1. Reduces resistance of solution permitting use of increased current density.
2. Permits use of lower voltage preventing formation of "trees" and rough deposits.
3. Increases cathode polarization, thus improving throwing power.
4. In the case of copper sulphate and silver cyanide solution, it increases throwing power by increasing conductivity.

High Metal Ion Concentration

Undesirable Effects

1. Produces large crystals of deposited metal. This can be corrected by addition of a salt with a common ion, thus reducing metal ion concentration.
2. Unsatisfactory, or at least not the best throwing power obtainable.

High Metal But Low Metal Ion Concentration

Desirable Effects

1. Condition favorable to cathode polarization and therefore good throwing power.

Thus we have summarized all the factors of the solution composition and operation that have an effect on the uniformity of metal distribution. By the proper use and combination of these factors the plater should be in a position to deposit to thickness specifications economically.

The concluding installment of this article, which will discuss the practical aspects of controlling the uniformity of deposits, will appear in an early issue.—Ed.

[4]Current Distribution and Throwing Power—Trans. Amer. Elec. Chem. Soc., Vol. 43, 1923.

[5]Solution agitation by air is undesirable.

Shop Problems

CASTING • METALLURGICAL

FABRICATION • ASSEMBLING • • PLATING • FINISHING

Questions from readers relating to shop practice and answers by our associate editors

Cutting Down Gold

Q.—I am writing in regard to information on refining and cutting down gold to make gold solutions. I have done this kind of work before but I have been out of the trade for quite a while and things do not come back to me as quickly as I should like them to. Now if you can recommend a good book to cover what I am after I would like to hear from you.

A.—The type of gold solution that is to be used will determine the method to be employed in cutting down the gold. If a cyanide solution is to be made, the porous cup method is quite generally used.

Briefly, this method may be summarized as follows: a 4 oz./gal. sodium or potassium cyanide solution in which either 24 K. or lower alloy karat gold strips are suspended from the anode rod, is used. The cathode, a piece of copper or stainless steel (18-8) is placed in a porous porcelain pot with some of the cyanide solution. A pressure of about 4 volts is applied and the solution worked until the required amount of gold is dissolved from the anodes. This can be determined by occasional weighing. It may be necessary to regulate the voltage to prevent polarization of the anode. The heating of the solution to about 110-120 deg. F. will speed up the solution of the gold. The use of field rheostat and ampere hour meter is usually essential for most satisfactory results.

The receptacle to be used for carrying out the gold dissolving can be a chemical stoneware crock or a porcelain enameled pot.

If a gold chloride solution is to be made up it is necessary to dissolve the gold with aqua regia (3 parts nitric and 1 hydrochloric acid) under a well ventilated hood in a pyrex glass flask. A small electric heater may be used. The amount of acid to be used will depend upon amount of gold to be dissolved. The operation should be carried on until all red fumes are drawn off. This will necessitate taking mixture down to almost dryness. Extreme care should be exercised in this operation as loss of gold can take place by solution spattering.

It is possible to save all this trouble of cutting gold down by buying prepared salts. Any concern dealing in precious metal salts can supply salts.

—T. H. C., Problem 5,683.

Silver on Nickel

Q.—I have difficulty with silver plate on nickel. The same solution works perfectly on brass, or if I give a copper flash between nickel and silver. Silver solution consists of 3 ozs. silver cyanide, 3 1/3 oz. sodium cyanide, 1 gal. water.

I cleaned the nickel in different ways and always have the same trouble. Parts of the article get dark

Use this Blank for Solution Analysis Information

Fill in all items if possible.

Date .....

Name ..... Class of work being plated: .....
Address ..... City ..... State ..... Volume used: .....
Employed by: ..... Solution depth: .....
Kind of solution: ..... Cathode surface, sq. ft.: .....
Tank length: ..... width: ..... Kind of anodes: .....
Anode surface, sq. ft.: ..... Distance from cathode ..... Original formula of solution: .....

REMARKS: Describe trouble completely. Give cleaning methods employed. Send small sample of work showing defect if possible.

Use separate sheet if necessary. _____

NOTE: Before taking sample of solution, bring it to proper operating level with water; stir thoroughly; take sample in 2 or 3 oz. clean bottle; label bottle with name of solution and name of sender. PACK IT PROPERLY and mail to METAL INDUSTRY, 116 John Street, New York City.

first and after prolonged plating finally covers, but blisters afterwards.

A.—In order to obtain good adherence of a silver deposit it is necessary first to cover the article with a "strike" deposit.

This is necessary because when metal is placed in a regular silver plating solution even with current, the initial coating of silver will deposit chemically by immersion. This immersion deposit is not adherent, so that subsequent thickness of electrodeposited silver will peel.

Silver strike solutions are made as follows:

First strike for steel:

Silver cyanide	.2 oz.
Basic copper carbonate	2.0 ozs.
Potassium cyanide	9.0 ozs.
Water to make	1 gal.

Anodes-gas carbon or stainless steel. About 1/10th of the anode area should be copper and silver (¾ copper, ¼ silver). Six volts. Regulate anode area to meet conditions.

Second strike for steel. First strike for brass, copper, nickel, nickel-silver, and britannia:—

Silver cyanide	.5 oz.
Potassium cyanide	9.0 ozs.
Water to make	1 gal.

Silver anodes. Six volts. Use insoluble anode area if silver content increases too rapidly.

A blue dip can be used on copper and brass instead of a silver strike, although its use is not recommended as the mercury will cause season cracking of the brass.

Mercuric oxide	1 oz.
Sodium cyanide	8 ozs.
Water to make	1 gal.

The above information is taken from page 29 of the 1938 edition of the Platers' Guidebook, published by METAL INDUSTRY.—G. B. H., Jr., Problem 5,684.

Barrel Plating Die Castings

Q.—We should esteem it a favor if you would kindly inform us whether it is possible to satisfactorily electro-plate zinc base die castings by barrel coppering, barrel brassing or barrel nickeling.

A.—The barrel plating of zinc die castings is limited in its use, first by the shape and size of the castings, and second by the type of plate to be deposited.

Castings of intricate shape and protrusions do not lend themselves to barrel plating as throwing power is limited and there is a decided tendency to break down sharp edges or protrusions due to tumbling action. In any case the speed of barrel would have to be adapted to the article to be plated so as not to cause damage by tumbling. Small regular shaped castings that would not be inclined to nest would probably work out most satisfactory.

The depositing of nickel directly cannot be accomplished with any success without first depositing a heavy coating of copper from cyanide solution. A copper deposit of at least .0005" should be applied before depositing nickel.

The casting should be given either a buffed or rolled finish before copper plating if a bright finish is desired. Naturally the copper deposit would also have to be finished in order to be able to finish the nickel coating either by coloring or ball burnishing.

In order to deposit brass sucessfully a very heavy coating would be necessary in order to prevent complete absorption of the deposit. The thickness of deposit mentioned under copper would apply for brass coatings. It might be well even in the case of brass to deposit copper first in order to insure a satisfactory coating.

While barrel plating of zinc die castings can be accomplished with certain types of metal deposits, its application is limited.—T. H. C., Problem 5,685.

Corroded Nickel Plate

Q.—We are sending you a steel percolator cover and would like you to examine this and let us know what is the cause of the condition on the inside. This cover has been in use about three months.

A.—The difficulty appears to be due to insufficient thickness of nickel. A quick test to determine if the nickel coating is continuous can be made by dipping in a copper sulphate solution (acid copper plating solution is all right). Copper will show through at points where the steel is not thoroughly covered. However, it would not be advisable to assume that if no copper shows that the nickel thickness is sufficient. Due to the severe corrosive condition to which the under side of the cover is subjected a fairly heavy plate is necessary for reasonable length of service. The nickel thickness should be at least .0005" and preferably heavier.

It was noted that the sample submitted showed copper on the under side when dipped in copper sulphate solution.—G. B. H., Jr., Problem 5,686.

Dark, Streaky Silver

Q.—We are sending you under separate cover via parcel post a small sample of silver solution for your analysis. We have recently made a change of foreman in our plating plant and would like an analysis for the guidance of the new man.

We use this solution for plating lighting fixtures and have experienced the difficulty of having part of our work show dark streaks under the lacquer after the fixtures have been completed for a period of from two to eight months.

A.—The analysis of the silver solutions shows:

Silver,	1.91 tr. ozs./gal.
Free sodium cyanide,	3.70 av. ozs./gal.

This solution is not in bad condition as far as the silver and free cyanide are concerned.

We have no sample of work showing the defect mentioned, but from your description it appears that the deposit may be absorbed into the base metal thus causing the dark streaks to occur after a period of time. The lacquer should also be checked.

If absorption is occurring then the base metal will have to receive an intermediate plate such as nickel.

—G. B. H., Jr., Problem 5,687.

Filter Construction

Q.—I wish to use a filter for plating solutions with bronze pump and tin lined copper and brass filter. Is this advisable?

A.—It would not be advisable to use the above type of construction for filtering cyanide silver solutions. The bronze will cause silver to deposit by immersion. Also the cyanide will attack the bronze as well as the tin.

An iron pump and iron or steel parts in the filter construction should be used.—G. B. H., Jr., Problem 5,688.

Metal Casting Digest

Short abstracts of articles of interest to practical non-ferrous foundrymen and metallurgists

By H. M. ST. JOHN
Associate Editor

Minor Constituents in Copper-Lead Alloys. Hans Osborg. Metal Progress, Jan., 1938, page 43.—Minor constituents have an appreciable influence in the homogeneous distribution vs. segregation of constituents in copper-lead alloys. I. Minor constituents, such as tin, added to strengthen the copper matrix, tend to increase segregation. Manganese also probably belongs in this group. II. Nickel, 1 to 3%, with controlled overheating, produces homogeneous alloys in practically all proportions. Silver should produce a similar effect. III. The tendency to segregate can be suppressed by the presence of sulphides or other semi-metallic compounds which appear to increase the mutual solubility of copper and lead. These hard, brittle constituents are usually objectionable in the finished part. IV. Silicon, lithium, calcium and tellurium, with slight solid solubility in either copper or lead, improve the physical properties of the matrices. V. Another group of elements acts as scavengers, deoxidizing, desulphurizing and degasifying the molten metal. VI. A second minor constituent often greatly modifies the influence of the first. In a copper-lead-tin alloy 0.05% phosphorus noticeably reduces the tendency to segregate. It has been noticed that such alloys when made from scrap are less likely to segregate than when made from virgin metals.

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A Study of Core Hardness. H. W. Dietert and Earl Woodliff. Trans. Amer. Foundrymen's Assoc., Feb., 1938, page 545.—The authors describe a scratch test which measures what they term the hardness of the core surface. A series of tests under controlled conditions demonstrated that the maximum strength and hardness were obtained at a baking temperature of 350°F, a figure which would undoubtedly vary somewhat with the type of oil and mixture used. Baking time is an important but also variable factor. Permeability is not affected by baking time or temperature. Core hardness and permeability increase as the moisture content of the sand is increased but maximum strength is obtained at zero moisture. At low moisture contents the strength is very low, increasing, with Michigan City sand, to a second high point at 6 to 8% moisture. Maximum hardness is obtained by baking cores as soon as made, maximum strength by allowing them to stand 6 hours before baking. Permeability is not affected by this factor.

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A Correlation of the Physical and Chemical Properties of Clays With the Durability of Molding Sands. C. E. Schubert. Trans. Amer. Foundrymen's Assoc., Feb. 1938, page 661.—Three methods have been tried by previous investigators to determine the durability of molding sands: (1) the mold test method, (2) the oven test method, (3) the hydration and dehydration method. The first of these is time-consuming, while the last two are shorter but generally believed to be less accurate. The author finds that it is not possible to predict the life of molding sands by any of the three methods. It is more economical to add bond after the sand has been used for a number of heats rather than to hold strength constant by frequent additions of bond. Durability depends on the physical and chemical properties of the mineral or minerals in the bond.

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The Effect of Coke on Metals. Anon. Aluminum & The Non-Ferrous Review. Dec., 1937, page 85.—The sulphur content of coke should not exceed 0.8%, because of the danger of sulphur dioxide absorption in copper alloys. The volatile content should also be low and the coke should be dried free from water since hydrocarbon gases, carbon dioxide and hydrogen may also make trouble. At best there is much danger of gas absorption and the molten metal should be protected by a liquid cover.

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Testing and Control of Foundry Sands. T. R. Walker. Refractories J., Vol. 13, p. 487 (1937); Chem. Abstracts, Jan. 10, 1938, col. 90.—A general discussion of the qualities desired and those found in several English foundry sands.

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Creep of Nonferrous Metals and Alloys. W. A. Baker. Brit. Non-Ferrous Metals Research Assoc., Research No. 58 (1937); Chem. Abstracts, Jan. 10, 1938, col. 92.—A review of published information.

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New Aluminum Bearing Metals. E. Vaders. Z. Metallkunde, Vol. 29, p. 155 (1937); Chem. Abstracts, Jan. 10, 1938, col. 93.—The desirable characteristics of bearing metals are discussed at length. In particular the alloy known as Alva 36, an alloy of aluminum, lead and antimony with small additions of copper, manganese and iron is compared with other common materials. The hardness of Alva 36 is greater than that of the tin-base alloys, while its plasticity is comparable to them, it can also be formed while hot. It can be used in place of either copper or tin bearing alloys.

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Technical Consideration on Foundry Technic of Brass, Bronze and German Silver. J. Derdinger. Bull. assoc. tech. fonderie, Vol. 11, p. 208 (1937); Chem. Abstracts, Jan. 10, 1938, col. 99.—A general discussion on casting practice.

Mechanical Properties of Some Tin Bronzes. H. Lepp. Foundry Trade J., Vol. 57, p. 321 (1937); Chem. Abstracts, Jan. 10, 1938, col. 99.—A review.

• • •

High Strength Light Alloys. E. R. Gadd. Metal Ind. (London), Jan. 7, 1938, page 5.—Annual review.

• • •

Applications of Die Castings. Dr. Arthur Street. Metal Ind. (London), Jan. 7, 1938, page 11.—Annual review.

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Bearing Metals and Materials: Development of New Alloys for High-Duty Work. H. N. Bassett. Metal Ind. (London), Jan. 7, 1938, page 25.—Annual review.

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Developments in Powder Metallurgy: I. The Present Position. Dr. W. D. Jones. Metal Ind. (London), Jan. 14, 1938, page 75.—The author gives a short account of the fundamentals of the subject and outlines the production methods at present in use: Cold pressing, cold and hot pressing, hot pressing. *Same. II.* Casting versus Powder Methods. Metal Ind. (London), Jan. 21, 1938, p. 97.—The author states that, by suitable technique, all the physical properties which are obtainable by casting methods can also be obtained equally well by powder methods, which, furthermore, are capable of producing a wide range of properties, sometimes distinctly unusual, which are quite unobtainable by casting methods.

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Progress in Non-Ferrous Castings: A Survey from the Engineering Standpoint. F. Hudson. Metal Ind. (London), Jan. 21, 1938, page 101.—H. discusses the wide range of copper alloys which can be improved by alloy additions and heat treatment. *Same II.* Metal Ind. (London), Jan. 28, 1938, page 127.—This installment deals with gating of test bars and castings, the addition of tin to nickel bronzes and the properties of these bronzes at high temperatures. Rapid melting is recommended in a furnace having a slightly oxidizing atmosphere to avoid absorption of hydrogen, sulphur and carbon. Manganese ore as a flux is helpful. Low-nickel bronzes seem to open up a new field to the foundryman. Their high strength and hardness, inexpensively obtained, make them suitable for a wide variety of high-duty applications. Bronzes containing over 10% nickel are termed high-nickel bronzes and are extensively used for valve fittings under corrosive water and steam conditions, also for extreme conditions of wear. Hardness values above 400 Brinell can be obtained in the as-cast condition with 10% tin bronzes, containing 20 to 40% nickel plus silicon. Alloys of this type can also be temper hardened.

Modern Production Equipment

New processes, machinery and supplies for metal products manufacturing and metal finishing

New Rolling Mill for Bridgeport Brass

In the largest expansion and modernization program undertaken in the non-ferrous metals industry since 1929, *Bridgeport Brass Company* announce the completion in September of a new rolling mill at Bridgeport, Conn., for the production of brass, copper and copper-base alloys for industrial and commercial use. Built at a cost of more than $4,500,000, the new plant, in which all rolling mill operations of the company will be located, marks the completion of the first major step in a long-range expansion and modernization program which was inaugurated early in 1937, according to an announcement by *Ralph E. Day*, president and general manager of the company.

The straight-line production principle has been used like that employed in other major industries. The plant has a total floor area of more than 220,000 square feet, which makes it the largest single unit of the thirty-four major buildings maintained by the company in Bridgeport. It is estimated that the new mill will have a production capacity of over 6,000,000 pounds of metal per month.

In addition to the new manufacturing plant, a new mill office and laboratory building has been constructed, in which all research, development and testing facilities of the company are housed. Approximately nine acres of ground adjoining other plants of the company were acquired for the construction of the rolling mill and the new office and laboratory building.

Ten thousand square feet of space in the basement of the new building will be used by the *Bridgeport Engravers Supply Company, Inc.*, a subsidiary of the company, for the special handling and finishing necessary for the production of engravers copper for photo engraving.

Since the plant will be devoted entirely to the production of brass, copper, bronze and other copper-base alloys in sheets, rolls and strips, the space now used in other plants of the company for rolling mill operations will be rearranged, modernized and, in some cases, expanded.

Aerial view of the Bridgeport Brass Company's new rolling mill (shown at left top).

Bright Nickel Process

Bright Nickel Corporation, 2177 E. Milwaukee Street, Detroit, Mich., is the owner of the Schloetter patents. An arrangement has been made whereby the licensing of the Schloetter methods is to be accomplished through several manufacturers. Three of these companies are at the present time ready to grant sub-licenses—*Harshaw Chemical Company*, Cleveland, Ohio; *McGean Chemical Company*, Cleveland, Ohio, and *The Udylite Company*, Detroit, Mich. Several other companies will soon be ready to grant sub-licenses.

Extra-Fine Filament Wire

Extreme precision in diamond-die drawing, quite as well as the production of a critical nickel alloy, is making possible the latest low-drain dry-battery 1.4-volt or T-9 series radio tubes. According to the Driver-Harris Co., Harrison, N. J., this filament is .0008 in. in diameter, or roughly one-quarter that of typical human hair. The cross-sectional area of the filament is one-fifteenth that of human hair. The filament wire is so fine that it can be seen with difficulty only under powerful light. There are 104 miles of such wire to the pound.

Latest Products

Each month the new products or services announced by companies in the metal and finishing equipment, supply and allied lines will be given brief mention here. More extended notices may appear later on any or all of these. In the meantime, complete data can be obtained from the companies mentioned.

Inclinable Press. Master Series A, with 6½" diameter shaft for heavy duty work. Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.

Unit Heaters. Fedders Series 4 in 25 models, ranging in capacities from 75 to 1,200 sq. ft. Fedders Manufacturing Co., Inc., Buffalo, N. Y.

Rectifiers for Cathodic Protection. "Rectox" rectifiers to eliminate galvanic action or electrolysis of underground pipe lines, cables, etc. Westinghouse Electric & Mfg. Co., Technical Press Service, E. Pittsburgh, Pa.

Pre-Cooler for Main Air Lines; for the better extraction of moisture from plant compressed air lines. Binks Mfg. Co., 3114-40 Carroll Ave., Chicago, Ill.

Sealer Extension Gun. Thor Model No. 7-H extension spray gun for applying sealer to body seams on the underside of automobile bodies to prevent dust from entering car body through open cracks. Binks Mfg. Co., 3114 Carroll Ave., Chicago, Ill.

New Mounting Style for Portable Painting Outfit; adaptable to bumper or frame of passenger car or truck; trailer type. Binks Mfg. Co., 3114 Carroll Ave., Chicago, Ill.

Water Cools Both Gas Engine and Compressor. A combination of water cooled compressor and gasoline engine for driving it in which the same water is used for cooling both machines. Binks Manufacturing Co., 3114 Carroll Ave., Chicago, Ill.

Auto Spray Booths; for operators of fleets of trucks or cars; can be purchased in sections permitting user to utilize his own walls as a part of the booth. Binks Mfg. Co., 3114 Carroll Ave., Chicago, Ill.

75,000 *RPM Grinder.* Onsrud Air Turbine Grinder with high spindle speeds using 1/6 H.P. motor, weighing 12 ounces. Onsrud Machine Works, Inc., 3900-42 Palmer St., Chicago, Ill.

Non-Slip Wax to Minimize Accidents on Smooth Floors. Flexrock Co., 800 N. Delaware Ave., Philadelphia, Pa.

Air-o-Line Furnace Pressure Controller; to indicate and control low range pressures and drafts in all types of furnaces. The Brown Instrument Co., Philadelphia, Pa.

Precision Surface Grinder; said to be the largest of its type ever built. Table capacity 30" wide by 16' long and a base length of 36'. Mattison Machine Works, Rockford, Ill.

Combination Microscope and Photographic Camera. The "Metaphot"; radically new design. George Scherr Co., 128 Lafayette St., New York.

Mechanical Automatic Control, for Reeves "Motodrive." Reeves Pulley Co., Columbus, Ind.

Telescopic Stacker with Retractable Revolving Base; PBRT 1923. Lewis-Shepard Sales Corp., 245 Walnut St., Watertown, Mass.

Portable Drill. "Holgun"; a heavy duty production unit. Black & Decker Mfg. Co., Towson, Md.

Alternating Current Arc Welder for Light Gage Work. General Electric Co., Schenectady, N. Y.

150 *Ampere Alternating D.C. Welder.* General Electric Co., Schenectady, N. Y.

All-Angle Vise; portable, multi-swivel; recommended for tool makers. Fray-Mershon, Inc., 515 W. Windsor Rd., Glendale, Calif.

Hole Saws; "Pilot" for fast hole cutting on soft metals and other materials except iron and steel. Fray-Mershon, Inc., 515 W. Windsor Rd., Glendale, Calif.

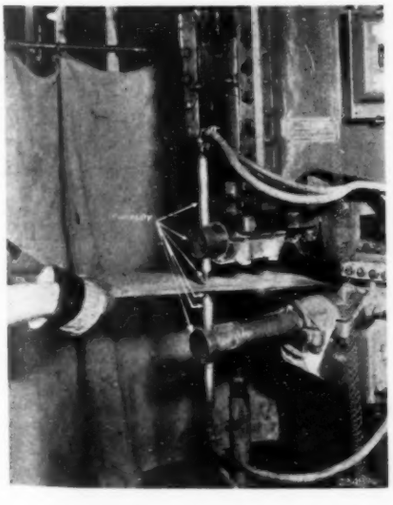
Streamlined Punch Presses. Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.

Tests on Copper Alloy

Cupaloy is the trade name of a copper alloy developed by the Westinghouse Electric and Mfg. Co., Pittsburgh, Pa.

Cupaloy castings are used for delivering electric current to a large machine for welding pipes. In one process of heat treating the alloy castings for this machine, the castings were withdrawn from a furnace at 1832° F. and then quenched in iced water. Cupaloy is used as an ally of the ignitron tube in making possible continuous welds which are so strong and gastight that this process has found wide use in the construction of streamlined trains, cooling systems for electric refrigerators and high-vacuum thermionic tubes for radio sets.

In service as welding tips, Cupaloy is said to have shown a service life several times greater than pure copper and from



Cupaloy welding tips on a spot welder

Cupaloy engraving pressed into steel

50 to 200 per cent longer than that of other low resistance alloys.

Research engineers placed a half-inch bar of Cupaloy against a bar of standard hot-rolled structural steel and squeezed the two together under a hydraulic press. An engraved insignia on the Cupaloy sample made a deep indentation into the steel, but the Cupaloy was scarcely marked.

P. H. Brace, consulting metallurgist of the Westinghouse Electric & Manufacturing Company's research laboratories, initiated five years ago the experiments which have culminated in the practical application of Cupaloy as welding electrodes, slip rings for generator rotors, cylinder heads in internal combustion engines and fuse clips in high tension switching devices.

Despite rapid advances in science in the twentieth century, metallurgists today are still unable to make pure copper much more hard than were the old time coppersmiths with their hammer and anvil. By cold-working, pure copper can be hardened to a considerable degree but this hardness is lost at relatively low temperatures. Cupaloy, however, comes within something less than one per cent of answering this metal riddle. Chromium and silver, in minute quantities are the addition agents.

The alloy is so strong that the tensile stress required to produce a plastic deformation of one part in 10,000 is about 25,000 pounds per square inch. The electrical conductivity is about 90 per cent of the conductivity of pure copper.

This temper-hardened material still has a great deal of ductility and is able to be hardened further by drawing it through dies, rolling or hammering. These additional treatments bring Cupaloy to an elastic limit of 35,000 pounds per square inch with but little impairment of its heat or electrical conductivity.

While pure copper loses much of its work hardness after a few hours' exposure to temperatures of only 392° F. Cupaloy will withstand temperatures of 752° with relatively little permanent softening. Its rate of wear under the most severe tests was only 40 per cent of that of hard-drawn copper.

Because of its high strength and hardness, its exceptional wear resistance, heat endurance and high electrical and heat conductivity, Westinghouse engineers used Cupaloy as the current collecting surfaces for a homopolar generator rotor required to carry currents of 150,000 amperes while under an unusually high centrifugal stress.

Previously, large machines of this type were handicapped because of the lack of a high-conductivity material capable of withstanding the combined effects of high temperatures and the racing of the rotor at very high speeds.

Welding Helmet

Industrial Products Co., 800 W. Somerset St., Philadelphia, Pa., has designed a new helmet for welders.

The helmet is made of selected chrome leather on a specially constructed vulcanized fibre headgear. The helmet has a "flip front". The outer section of the composition glass holder flips up instantly for weld inspection, actuated by springs which are enclosed in the hinge joints. The clear glass on the inside protects the eyes from foreign particles during the wire brushing and cleaning operation.

Ipco chrome-leather welding helmet

Industrial Model pH Meter

A new model of the well known Beckman pH meter has many features designed to make it particularly useful for general industrial work. It combines the accuracy of the recognized glass electrode system with operating simplicity and over-all ruggedness. It can be used with equal efficiency by technical and non-technical men, and will withstand the rough usage and severe operating conditions that are encountered in factory applications.

The operating principle is simple and positive. The glass electrodes are merely immersed in the test solution whereupon a minute electrical potential, varying with the pH, is generated in the electrodes by the solution. This potential is amplified by a special electronic amplifier, and at the touch of a button, operates a calibrated meter which accurately and instantly gives the exact pH readings. There are no charts to read, no comparisons to make, and nothing to compute.

Beckman pH meter

Shielded Glass Electrode System

The glass electrode system can be safely used in viscous or semi-solid substances and in rapidly circulating or flowing liquids. It allows accurate determinations to be made in practically any solution regardless of color, viscosity, suspended solids, or chemical nature, which is a feature of tremendous value in industrial work. The electrode system and lead wire are completely shielded—another exclusive feature—and may be used in vats, tanks, or any other location at a remote distance from the meter without danger of picking up electrostatic interferences.

Continuous pH Indication

An outstanding feature of the Beckman Industrial Model is the fact that for the first time, it makes continuous indication possible in pH determinations. The electrodes may be placed in flowing solutions or in tanks where the pH is subject to fluctuations, and, by locking the button down, the meter will continuously and automatically indicate the exact pH of the solution, leaving the operator's hands completely free for recording, titration, or any other work.

Dual Scale Meter

A dual scale meter is used which gives a very high reading accuracy by providing ample separation between meter points. A switch is used to change scale, and in the first position the full scale of the meter covers the acid range, 0-7 pH; and in the second position the full scale covers the alkaline range, 7-14 pH. This arrangement spreads the complete pH range double length and permits readings to be made to .02 pH.

The Beckman Industrial pH Meter is entirely self-contained in a compact hardwood case. The cover is detachable for greater convenience and has a safety device which prevents the meter from being closed until it is completely shut off.

New Literature

National Technical Laboratories, Pasadena, Calif., are distributing an illustrated booklet on the Industrial Model, showing its many features and describing briefly how pH is being used in modern industrial control. This booklet is free, and those interested in pH control are invited to write for it.

Automatic Polishing and Buffing Machine

The illustration shows a "Strait Line" automatic polishing and buffing machine designed by the Hammond Machinery Builders, 1601 Douglas Ave., Kalamazoo, for running board molding. This machine is 42 ft. long overall and has twelve heads, each head being powered by a 7½ H.P. motor. It can be furnished with any number of heads, depending upon customer's requirements, thereby increasing or shortening the length of the machine. This particular model has motor on spindle heads and the speed is limited to the motor speed. Belted heads may be had if desired and which provide any speed.

Hammond "Strait Line" polishing machine

The wheel heads are balanced insuring uniform wheel pressure and are adjustable from horizontal to vertical wheel positions. Spindles are mounted on anti-friction sealed bearings.

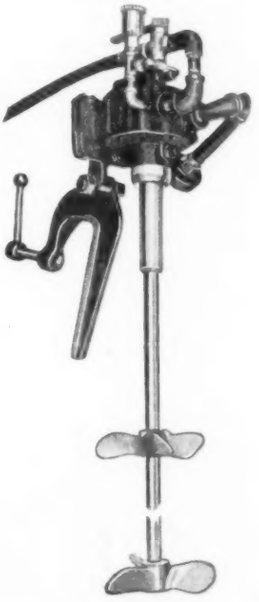
The cast iron platens are mounted on ball bearings and travel over steel ways. They are connected to a heavy conveyor chain which is driven by a variable speed unit.

Each motor is connected with an individual switch, but the machine is also wired with one safety switch which will stop all motors and the drive—a very desirable safety feature.

All moving parts are protected so dirt and abrasive matter cannot come in contact with any wearing part.

Air-Operated Agitator

The Eclipse Air Brush Company, 390 Park Avenue, Newark, N. J., has developed an air-motor operated agitator known as the Pneumix Type B, to handle batches of material up to 100 gallons. The outstanding feature of this stirring device is its safety element: it is spark-proof and cannot heat. This feature is of particular interest to the handler of inflammable organic compounds and solvents.



Eclipse "Pneumix" Type B agitator

The speed of the Pneumix is variable—from 30 to 6000 RPM, requiring from 5 to 50 pounds pressure; controlled by the air intake on the motor. This is an important item where there is a change of viscosity of the material during the mixing operation.

Quiet operation has been assured by the installation of a muffler in the exhaust line. Splash-proof performance has been provided by having the two propeller blades

"throw" toward each other; and the entire construction has been so designed that all internal working parts are protected against any splashing or dripping. The upper propeller is removable, so that the unit can be used on smaller amounts of material.

The shaft is available in chromium-plated steel, stainless steel or bronze; the blades in chromium-plated brass or stainless steel. Parts made of other materials can be supplied to order. The shaft is removable so that it can be replaced with another of a different metal when a change in material requires it.

The over-all size of the Pnemix Type B is 40" by 6" and it weighs only 17 lbs.

Two-Speed Polisher

A new addition to the Hammond Machinery Builders', Kalamazoo, Mich., line of polishing and buffing equipment is the two-speed model C-2 Rite-Speed polishing and buffing lathe.

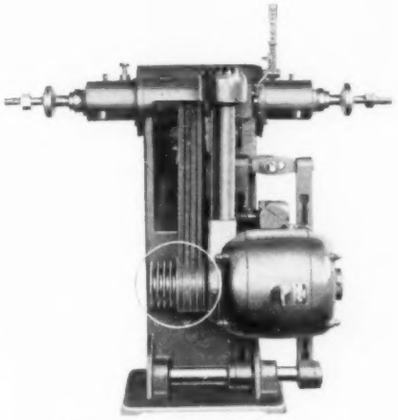
Change of speeds is effected easily and quickly by adjusting the position of the motor by a convenient belt tension nut and transferring the belts from one set of sheaves to the other.

The belt guard is not shown in the illustration. However, a heavy enclosed steel belt guard is standard equipment with a door at the side so it is convenient to transfer belts on the motor sheave. The belt guard does not have to be removed when changing speeds.

The spindle sheave is accessible by means of a hinged steel cover as shown.

In plants where it would be an advantage to have more than one speed lathes and the investment in a Hammond Vari-Speed (any speed) machine is not justified, this new model will be of interest. It costs only a few dollars more than a standard single speed machine.

Standard equipment includes the combination switch and brake, heavy one-piece manganese ground spindle with flat top threads operating on ball bearings, magnetic switch, and motor air cleaner unit with motor. Totally-enclosed fan-cooled motor may be had if preferred.



Hammond G-2 polishing lathe

Gyro Electric Sander

A new type of portable electric sanding machine is announced by the Sterling Products Company, 2457 Woodward Ave., Detroit, Michigan. The machine is sold under the trade name Sterling Electric Gyro sander. This machine is not intended to replace the pneumatic or electric Sterling Speed-Bloc sanders manufactured by this company, but is added as a companion to complete their line of mechanical sanders.

The movement of the sanding pad on this machine is unique in machine sanding and closely simulates the hand sanding motion of cabinet and furniture craftsmen. The abrasive paper attached to the bottom of the pad has a movement whereby each particle of the abrasive moves in a centroid of approximately 5/16 of an inch. The outstanding features of this movement are extremely high cutting speed, uniform finish and the elimination of chasing and graining effects.

The machine is said to be efficient for heavy production jobs yet flexible enough for the lightest work.

The machine is driven by heavy duty ¼ H.P. 3450 R.P. electric motor. Power is transmitted to the sander head by a new type extremely flexible shaft.

Three different types of motor mountings are provided; the bench plate type for use on the work bench; ceiling suspended type with the motor suspended from the ceiling or overhead trolley by means of a yoke; adjustable height pedestal model with motor mounted on three-leg caster base.

Sterling "Gyro" sander

Stop-off Lacquers

The Michigan Chrome Company, 6340 East Jefferson Avenue, Detroit, Michigan, have recently developed and placed on the market two new types of stop-off lacquers for insulating plating racks for decorative plating and for masking parts to be hard chromium plated. These lacquers, which offer the distinction of being manufactured by a company which has had a background of years of experience in actual plating work, are to be known as Miccro Supreme Stop-off Lacquers. They are applied directly on the metal surface with no treatment necessary other than a thorough cleaning of the surface to be coated.

The lacquers used for insulating plating racks are said to have proved to be practically unaffected through the regular cycle of decorative plating. Tests conducted over prolonged periods with alkaline cleaner at 212 degrees F., showed the coating to be still effective after 500 hours of continuous immersion. Other processes for which these lacquers are recommended are concentrated or diluted hydrochloric acid or sulphuric acid dips, cyanide or acid copper baths and chromic acid baths. They are equally impervious too nitric or hydrofiouric acids and have proved satisfactory for use with degreasing units.

In use with hard chromium plating processes, the lacquers, while offering exceptional adhesion can be removed easily after plating, permitting thorough cleaning of all parts which have been coated. They possess rapid air drying qualities. As edges can be trimmed easily and excess lacquer can be quickly removed with a lacquer thinner furnished by this company, they lend themselves to accurate plating work. As the material is absolutely neutral, and not contaminated by acid or other destructive substances, there is no possibility of etching in machined parts that have been precision lapped. These lacquers are particularly recommended for coating permanent hard plating racks.

Among other applications for these lacquers are their use for tank coatings, insulating bus-bars to prevent corrosion, the protection of ventilating systems, and as a covering for water lines to prevent sweating or rusting.

Aluminum Paint Package

Subox Inc. of 344 River Road, North Arlington, N. J., are now furnishing their Aluminox in a new all-service form of packing. The unit is composed of a 12-gallon can furnished with a spigot containing the vehicle, while a high grade aluminum paste forms the pigment. This unit is intended to serve particularly the smaller manufacturer who may want to use an aluminum paint as a finish for his product or a maintenance paint. By adjusting the proportions of the pigment and vehicle, Aluminox is suitable for all these uses. When force dried, it makes a very hard coating. The unit is very convenient, prevents spillage and waste, and takes a minimum amount of space for storage. Paste and vehicle can be ordered separately.

Electro-Galvanizing Process

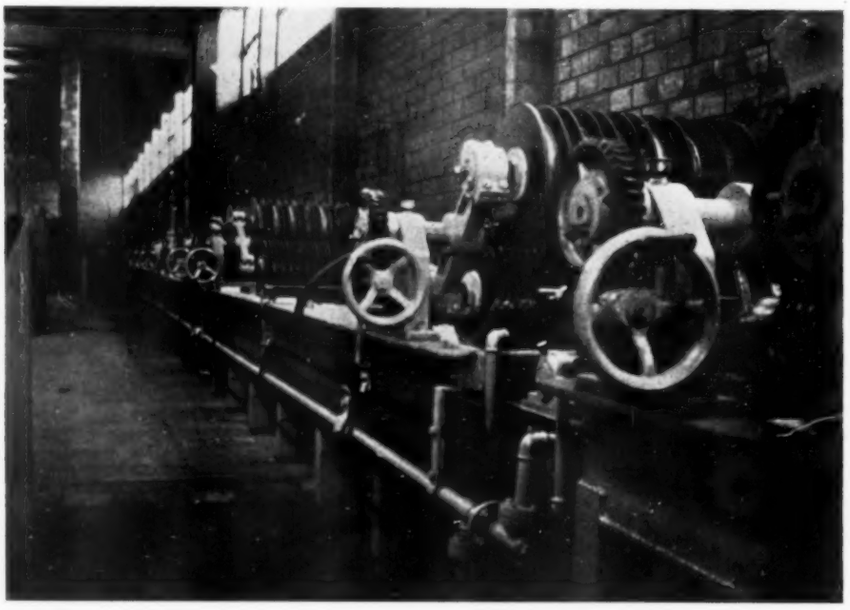
The Marino electro-galvanizing process, which is said to have had a successful five-year trial in England under rigid mill production conditions, is being offered in the United States and Canada for license or sale through the office of George D. Hartley, Consultant, 311 Main Street, Worcester, Massachusetts. By this process thousands of tons of wire have been produced for the trade in sizes ranging from ½" rods down to the finest wires.

This process, incorporating electro-galvanizing, pickling and galvanizing is entirely automatic and will cover wires and shapes with tin, lead, copper, brass, nickel, cadmium, or other metals and alloys. It is stated that production schedules have proved it to be 50% faster than hot galvanizing, and cost sheets have shown it to be 40% cheaper. The Marino process is particularly recommended where rigid specifications are demanded, one mill in England turning out 50 tons of Marino galvanized high tensile wire weekly for British Government agencies. Wires such as are used in rope manufacture, and in the various shapes, are produced in quantity.

A list of 10 distinct advantages claimed are given below:

1. 50% faster; 40% cheaper than hot galvanizing.
2. High class, first quality coatings which easily meet all British and American tests and standards.
3. Electro-galvanized coat, thicknesses being equal, stands up better under atmospheric, brine, or acid fume conditions.
4. Wire is not embrittled by acid and heat combination.
5. Wire retains torsions and bends unchanged as is desirable in springs, etc.
6. No losses from oxidization; no dross.
7. No heat is used; hence fuel, burnt pots and furnaces are eliminated.
8. Process eliminates heat and dirt, smoke and unhealthy conditions.
9. Process tried and proven by five years of actual operation under mill production schedules.
10. Process fully protected by mechanical and chemical patents.

Mr. Hartley, who has been identified with the wire trade for the past twenty-five years, will act as Mr. Marino's agent in the United States and Canada in the licensing and installation of this process.



A Marino electro-galvanizing unit in operation in England

New Finish

Hilo Varnish Corp., 42-60 Stewart Ave., Brooklyn, N. Y., announces the release of a new porcelain-like, short-bake, synthetic enamel, known as Vitra-Carlite. It covers excellently in one coat, laying on with a full smooth film; may be used for brush, spray, dip or tumble. Also excellent hardness and "marproofness." Has chemical resistance, especially to solvents, oils, greases, etc. Working samples and complete information furnished upon request.

Low-Resistance Respirator

Willson Products, Inc., 267 Thorn St., Reading, Pa., announce a new low-resistance chemical cartridge respirator especially designed for plating operations, brazing, paint spraying, etc., and for use in light concentrations of organic vapors and acid gases. This new respirator, which is available in either 190 or 100 cc. content, has several unique and distinctive features. It employs two inexpensive replaceable cartridges which results in a very low breathing resistance. The use of extra large cartridges affords an unusually large degree of protection.

The new form-fitting rubber face piece conforms to the face, out of the way, and permits better visibility. Spectacles or goggles may be worn with absolute comfort and the entire respirator is so compact that it may be worn underneath a welders' helmet without interference.

Three separate chemical fills are available depending upon the use to which the respirator is to be put. Under no consideration should this respirator be worn for protection against carbon monoxide or in an atmosphere deficient in oxygen. The manufacturer will gladly furnish complete information, descriptive literature and prices upon request.

Willson Respirator

Metal Protective

Causticbond is a black resin compound developed by the Williams & Wilbur Company, Park Sq. Bldg., Boston, Mass., as a protective coating for wood or metal exposed to liquid acids or caustics. It gives a black semi-gloss finish. This material is recommended for lining tanks and protecting machinery from spillage. It is resistant also to chloride gases and alcohol.

Welding Fluxes

"Fluxine" is the trade name given by Krembs & Company, 669 W. Ohio St., Chicago, Ill., to their line of fluxes for brazing, welding and silver or soft soldering. These fluxes are made in a variety of compositions suitable not only for a number of ferrous and non-ferrous alloys but also for different methods of joining them, such as gas welding, gas brazing, silver soldering, soft soldering, etc. They are also applicable, it is stated, to special solders and welding rods over a wide range, including Easy-Flo, Sil-Fos, Braz-Weld, phosphor copper, etc. Special numbers are available for furnace or spelter brazing, arc welding (carbon or metallic), spot or flash welding, etc.

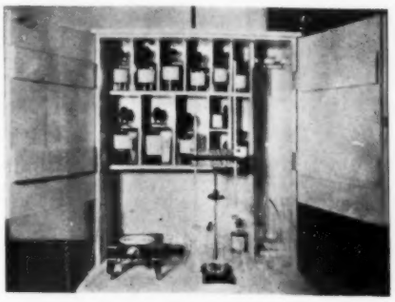
Krembs & Company also manufacture "Flexine Spelter" mixtures, Flurine coated electrodes, in a variety of types, Fluxine pastes for low melting silver rods, Fluxine Phos-Copper brazing and welding paste for low melting alloy rods.

Analytical Test Kit for Alkaline Zinc Solutions

An Analytical Test Kit made by the Hanson-Van Winkle-Munning Co., Matawan, N. J., manufacturers of electroplating equipment and supplies, is described as "a complete laboratory for the analysis of cyanide zinc solutions." The outfit consists of all of the chemical solutions and apparatus necessary for making the analysis, arranged in a suitable cabinet. The cabinet when closed is dust-tight and can be locked. When the two doors are open and the bottom portion lowered, the bottles of solution are within easy reach, and ample working space is provided.

Solutions are analyzed according to the methods given in the booklet "Simple Methods of Analyzing Plating Solutions" issued by the Company. These methods are standard, simplified and shortened but, nevertheless, accurate and reproducible. Anyone, regardless of previous experience, can learn in a few hours to control plating solutions by these methods.

The solutions are carefully standardized and contained in chemically resistant glass-stoppered bottles. The proper factors given on the labels convert readings directly into ounces per gallon of the particular constituent sought. Refills are obtainable at moderate cost.



H-VW-M analytical test kit for cyanide zinc solutions

The parts of apparatus (beakers, burettes, funnels, etc.) to be subjected to heat, are made of pyrex glass.

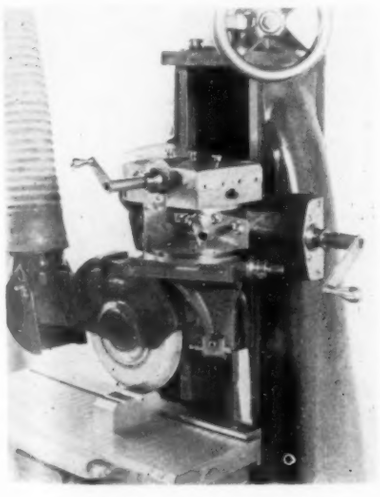
The cabinet occupies but a small space and can be stationed in any convenient place or even in the plating room if desired. By simply opening the cabinet the equipment is ready for operation.

It is only by controlling a bright or regular zinc solution that consistent results can be obtained. Having all materials necessary for the analysis in one cabinet is conducive to regular and frequent analysis.

Wheel-Truing Attachment

A new wheel-truing attachment developed by the U. S. Tool Co., Inc., Ampere (E. Orange), N. J., is designed to make it possible to dress any desired angular and radial forms on a wheel. Three adjustable slides on this unit permit the truing of any shape and the scope of application varies with the ingenuity of the operator, since angular and radial forms are blended with one another to give a continuous form surface. Settings used to obtain any form can be recorded as the adjustments are furnished with scales and the form may be duplicated at any time.

This attachment is permanently mounted on the grinder spindle column and can be brought into the position for truing a wheel quickly and easily without interfering with the work on the grinder table. It is always ready for use, out of the way and in no way interferes with the regular work of the grinder.



U. S. Wheel-truing attachment

New Synthetic Resins

Entry of the methacrylate esters into a wide variety of uses was recently described by three chemists who have played an important part in the development, *D. E. Strain, R. Grice Kennelly* and *H. R. Dittmar,* all of the du Pont Co., Wilmington, Del.

The several esters, all of them water-clear thermoplastic resins, were noted as having found commercial application as impregnants for metals and other substances. Materials treated in this way are more resistant to water, oils and chemicals.

"Polymeric methyl, ethyl, propyl, butyl and isobutyl esters of methacrylic acid have now reached a point of established commercial value," the authors stated. "Polymeric methyl methacrylate, the base of 'Lucite' plastic, is a hard, rigid resin of high tensible strength which softens above the boiling point of water. As the molecular weight of the alcohol increases, the polymers become softer and more plastic. Film-forming and adhesive properties, as well as solubility and compatibility, also change markedly along the series.

"They transmit a high proportion of visible light and are superior to glass in the transmission of ultra-violet light. They are color stable on exposure to light and have excellent aging properties, and are not discolored by heating and are extremely stable to decomposition by heat."

The methacrylate resins possess excellent film-forming and adhesive properties and because of their wide compatibility with solvents, plasticizers and resinous materials readily enter into more complex formulations, it was said.

Emulsions of wax-methacrylate compositions can be perpared readily, enabling coating to be carried out by spraying, brushing or dipping at normal temperatures. Films flowed from emulsions are characterized by the same toughness and flexibility as films deposited from melt.

Spray Nozzles

Spraying Systems Co., 4922 W. Grand Ave., Chicago, Ill., has developed a new line of spray nozzles for metal cleaning, rinsing and various industrial washing or wherever a penetrating rain-like full cone spray with uniform distribution is required.

These "Fulljet" spray nozzles are of sturdy construction accurately machined

"Fulljet" spray nozzles

and are now available with removable internal vanes in female pipe connection from ⅛″ to 3″. ⅛″ to ½″ are made with removable cap. Capacities range from 0.5 to 120 G.P.M. at 10 pounds pressure. Standard stock construction is brass but other metals can be specified.

Self-Lubricating Bearing Bronze

A new type of bearing material is now available for industry. Developed in the laboratories of the Johnson Bronze Company, New Castle, Pa., it involves an entirely new method of manufacture and imparts many new bearing properties. This new bearing material has been named Johnson Ledaloyl self-lubricating bearing bronze.

Ledaloyl can be classified, primarily, as a sintered type. However, an exclusive process of pre-alloying the basic metals imparts special characteristics. For instance it permits the introduction of lead to eliminate harshness and provide conformability for mis-alignment. In the manufacturing process, a definite amount of volatile material is included that later imparts a porous character to the bearing. By submersion, in vacuum tanks, these pores are filled with a high grade oil—of a viscosity to suit the application—and retain up to 35% oil by volume. The structure of the bearing is designed to permit a constant flow of oil to the shaft when needed and absorption when not in use.

A new booklet, describing this remarkable bearing material in detail is now available without cost.

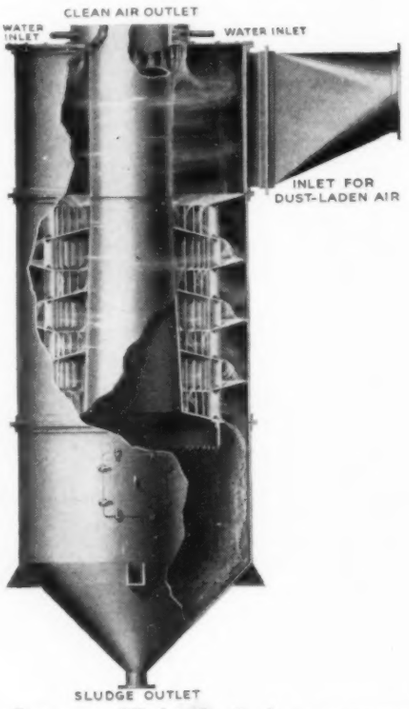
Dust and Fume Suppression

The Sturtevant Hydro-Clone system of dust and fume suppression is designed to suppress dust and fumes arising from manufacturing processes and operations in industry.

The Hydro-Clone as illustrated separates the dust from the air by a combination of centrifugal force and wet impingement and washing. The dust is precipitated in the form of sludge in the de-watering tank which is a part of the system and the water is recirculated through the Hydro-Clone, thus wasting no water. Hydro-Clone will not freeze during Winter operation.

Should it be desirable to collect usable dust in a dry form, this dust is separated in a Sturtevant Dry-Clone which connects with the Hydro-Clone where the fine nuisance dust is suppressed as a sludge. Thus, two products are obtained, a large percentage of coarse usable material and a sludge containing all the nuisance dust.

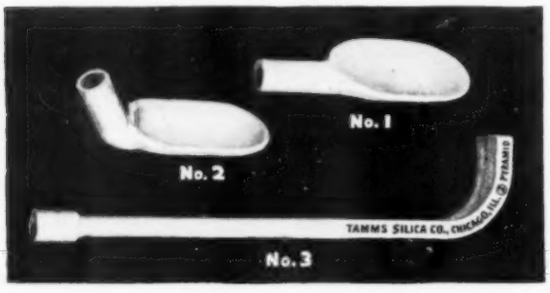
In handling fumes, smoke, fly-ash and dust at high temperatures, a combination of the Dry-Clone and Hydro-Clone is used. In this case the Dry-Clone serves as a pre-cooler and a trap for the heavy dust and the air passes to the Hydro-Clone for final cleaning. The Hydro-Clone is devoid of moving parts or spray nozzles. It is made by the Sturtevant Mill Co., Park and Clayton Streets, Dorchester, Boston, Mass.



Sturtevant "Hydro-clone" dust suppressor

Pyramid Skimmers

These skimmers are designed not to disintegrate or cause impurities in high temperature, nonferrous metals. Made of high-heat-resisting alloys, specially prepared for this purpose, they withstand high temperatures and are not affected by chemical action of alloy or flux. Skimmers which burn down leave definite traces of contamination in finished castings.



Tamms skimmers

The skimmers are manufactured by Tamms Silica Company, Foundry Division, 228 N. LaSalle St., Chicago, Illinois.

Primer and Rust Remover

Two new products have been developed for use on metals by the Nielco Chemical Co., 5411-21 Cicotte Ave., Detroit, Mich. "Galvo-Clean" is recommended for preparing galvanized metal, new or old, zinc die castings or any other metal containing a large percentage of zinc. It is said to produce a perfect bond for the paint, requiring no special paint or additional primer.

"Rust-Solv" is a semi-paste rust solvent for removing corrosion and protecting the metal. It is recommended for all types of metal surfaces, chromium plating, brass, copper, etc.

Anti-Corrosive Paints

For the past 15 years Subox Inc. of 342 River Road, North Arlington, N. J., have marketed Subox, a dark grey anti-corrosive paint based on a sub-oxide of lead pigment which is manufactured by a patented process. The pigment is distinguished by its high degree of dispersion and amorphous structure. The anti-corrosive effectiveness is further enhanced by certain chemical reactions which take place in the paint film.

Subalox is a mixture of Subox with aluminum. According to the percentages used, various attractive color effects ranging from a silver grey to a mouse grey are obtained, while the anti-corrosive properties of Subox are maintained. Subalox is a protective coating for maintenance work, and particularly when used on weathered galvanized surfaces, gives an excellent single coat protection lasting for a good many years.

In new construction a shop or priming coat of Subox followed by a field coat of either Subox or Subalox is recommended.

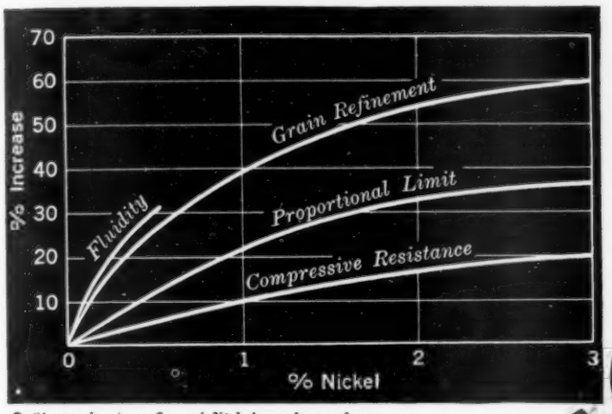
Metallizing Gun

Under the trade name: "Metco Metallizing Gun"—Type E, a new type metallizing gun has been marketed by the Metallizing Engineering Co., 44 Whitehall St., New York. The metal wire is automatically fed into the gun at an adjustable speed, where it is melted by means of oxy-acetylene or oxy-hydrogen flame, atomized by compressed air and sprayed on any base material. The gun may be used as a hand tool for coating large structures with zinc, aluminum, lead or other metals, or as a lathe tool for building up worn shafts, rolls, plungers, etc., with steel, stainless steel, nickel, Monel metal, bronze or any other metal obtainable in wire form.

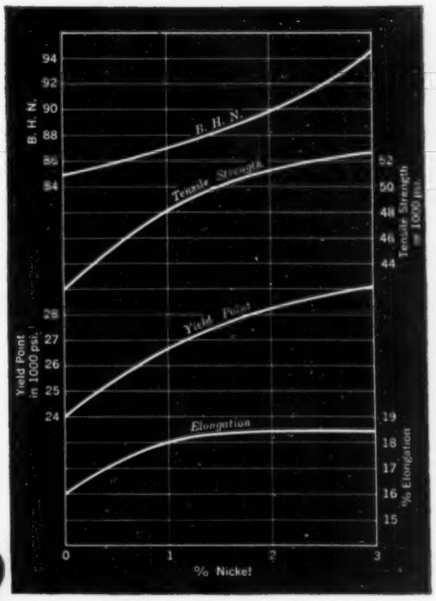
The Type E Metco Metallizing Gun was developed to meet the constant demand for faster, more reliable and more economical metallizing equipment. Extremely fine coatings are obtained at production speeds, and this combined with simplified adjustments, permit continuous operation with maintained speed and quality. Improved nozzle and jet construction reduce gas consumption and result in the deposit of a maximum amount of the metal sprayed, thus giving maximum efficiency and economy. Light weight (3¾ lbs.) perfect balance and easy hand grip, combine to eliminate operator fatigue. A multiple jet turbine makes instantly available two complete speed ranges, which cover all speeds necessary for commercial metals. Adequate power is available without changing gears. Operates equally well from acetylene tanks or generators at the maximum recommended pressure of 15 pounds. Only 60 pounds air pressure is required. The gun has been tested and approved by the National Board of Fire Underwriters.

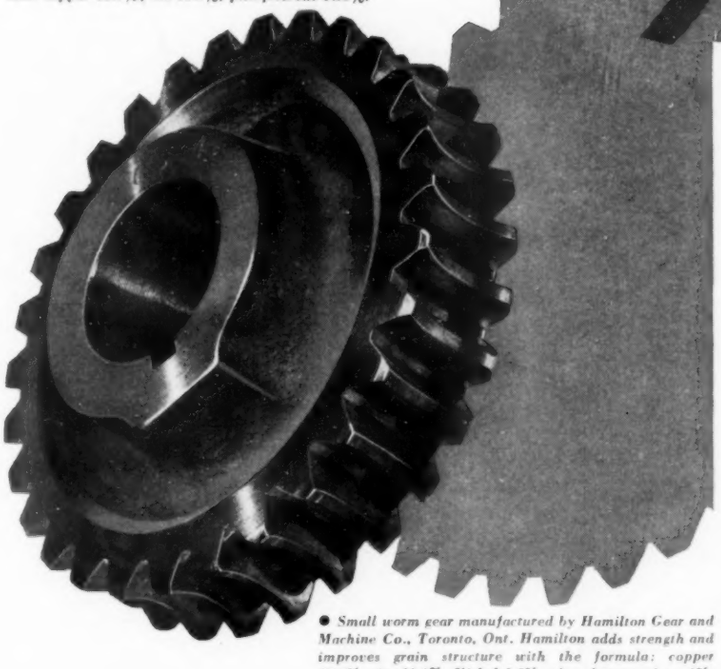
Metco metallizing gun, Type E

Here's ⇨ WHAT ⇩ NICKEL ADDS TO BRONZE Gears



● *Charts showing effect of Nickel on the mechanical properties of a sand cast gear bronze composition: copper 88.7%, tin 11.1%, phosphorous 0.03%.*





● *Small worm gear manufactured by Hamilton Gear and Machine Co., Toronto, Ont. Hamilton adds strength and improves grain structure with the formula: copper 87.5%, tin 11.0%, Nickel 1.5%, phosphorous .1 to .2%.*

Does your gearing need greater strength, greater toughness, greater hardness? Are the increased stresses encountered in modern high speed equipment causing bronze gears to fail prematurely? You will find by adding a small percentage of Nickel to bronze gear mixtures that improved mechanical properties are economically attained and that problems of design involving higher stresses and fatigue are simplified.

The charts above show how the common 89-11 bronze is improved by adding even small amounts of Nickel. There's little we could add to the convincing story these figures tell. Except to mention that the addition of Nickel also improves the casting properties, and gives a finer grain structure, with improved fracture.

Consultation on your requirements involving the use of Nickel is invited.

Nickel Brasses and Bronzes

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.

Multiple Burner Melting Furnace

Campbell-Hausfeld Co., Harrison, Ohio, has recently developed a new C-H multiple burner metal melting furnace, which they make in both the stationary and tilting types and in five standard sizes to accommodate any crucible from the No. 40 to 275, with metal capacities ranging from 120 to 825 lb. of brass per heat.

The shells of these furnaces are fabricated from ¼" special steel plate and equipped with a heavy steel bottom plate supported by a heavy angle ring welded to the shell of the furnace. The shell of the tilting type furnace is well balanced on heavy steel trunnions and supported on heavy cast iron legs. The trunnions are surrounded by 46 roller bearings to assure easy tilting.

The device for lifting and swinging the top refractory brick off and on the furnaces is an exclusive Hausfeld feature. This mechanism is supported on the leg of the furnace, independent of the shell, enabling the furnace operator to tilt the furnace with the cover on or off.

Campbell-Hausfeld multiple burner furnace

Spray Gun

The Alexander Milburn Co., 1493 W. Baltimore St., Baltimore, Md., announce their new OM Spray Gun for spray finishing with various fluids.

The OM Spray Gun is equipped with the "Hollow Air" atomizer head, with "Integral Locknut", which discharges air in hollow, conical shape from jets in the side wings, flattening the fluid by means of large, soft areas of air and atomizing to the outermost edges of the spray.

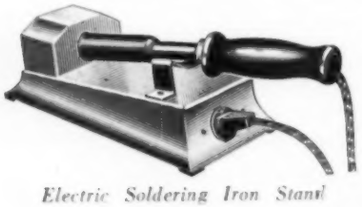
The Hollow Air system is recommended for spraying synthetic enamels, which are particularly difficult to atomize, but also sprays other fluids, such as lacquer, enamel, paint, shellac, varnish, stain, aeroplane dope, etc.

The OM Spray Gun is equipped with a replaceable thread baffle ring assembly eliminating the expense of separate spray heads. This assembly is held to a true concentricity on the spray gun body by a ground shoulder on the fluid nozzle, insuring positive alignment of the atomizer head locking ring. Replacement of the entire gun body or spray head is eliminated when threads have become worn.

Milburn OM spray gun

Thermostatic Control Stand for Soldering Iron

The Electric Soldering Iron Co. Inc., Deep River, Conn., has developed a new electric soldering iron stand with thermostatic control for maintaining constant temperature of the iron during the time when it lies idle. The stand saves considerable work in heating up cold irons, cleaning, filing and retinning the tips, etc. The control cuts the iron in and out of the circuit at any temperature. It can be used with any make of an iron with tips up to 1⅝" in diameter.



Electric Soldering Iron Stand

Bench Grinder

A new No. 66 "Victor" Bench Grinder, ¼ H.P., 110 volt motor, full ball bearing, 6-inch wheels, is now offered by Stanley Electric Tool Division, New Britain, Connecticut. The new grinder, low-priced, is particularly suited for general grinding, sharpening tools, buffing, polishing and wire brush work in garages and factories.

Finished in gray enamel, the No. 66 "Victor" Grinder is equipped with sturdy wheel guards, tool rests, toggle type switch, three-wire rubber covered cable, rubber feet, two grinding wheels 6 inches in diameter—one coarse and one fine.

Portable Electric Grinder

Three new grinders, manufactured in 4 in., 5 in., and 6 in. diameter wheel capacities, have just been announced by the Independent Pneumatic Tool Company, 600 West Jackson Boulevard, Chicago, Illinois. These grinders, states the company, are practical to use even on production work where constant, severe service is required because of a newly perfected method of vibration control. A simple change in the basic design of the spindle—substituting resilient steel strips for a single solid piece—provides this control of vibration from the wheel.

The spindle in Thor portable electric grinders is a two-piece shaft, joined with resilient steel strips to absorb and stop all vibration before it reaches the motor. The steel strips—not the motor—take the shocks and prevent lead wires to the commutator from becoming brittle and breaking. Motor burnouts, with their resultant production delays and repair costs, are avoided.

The 4" grinder, known as the Thor U54, is recommended for fast grinding on light jobs. It weighs 10 lbs., is 19 inches long and operates at a free speed of 6,000 R.P.M. The 5" grinder, called the Thor U55, operates at a slower speed for heavier duty work. It weighs 10¼ lbs., is 19½ in. long and runs at a free speed of 4,500 R.P.M. The 6" grinder, Thor U60, is designed for the very hardest kind of griinding jobs. It weighs 20 lbs., is 24½ in. long and has a free speed of 6,000 R.P.M.

A new booklet, giving complete specifications and prices, is available upon request.

Automatic Electric Glue Pot

The Vulcan electric glue pot is a product of the Vulcan Electric Company, Lynn, Mass., which combines two distinct safeguards for glue: (1) glue temperature maintained at 140 to 150 deg. F. maximum; (2) uniform application of heat—no localized overheating of the glue. A thermostat controlling the water jackets solves this problem.

The water, being confined in a close-fitting jacket, needs replacing only at long intervals. The removal of the water will not danger the quality of the glue. Heating is effected at the fastest rate consistent with maximum glue quality (approximately 45 minutes).

Vulcan electric glue pot

Cleaner

The Porcelain Enamel & Manufacturing Company, Baltimore, Md., has recently released to the porcelain enamel industry a new Pemco cleaner. This material cleans most mineral or vegetable oils from sheet iron commonly used for stamping or drawing operations, it is stated, because its action saponifies and emulsifies. Pemco cleaner is pre-combined and contains no free resin or any other ingredients which depend on high temperature reactions in the cleaner tank to effect perfect cleaning combination. All the components are soluble in warm water, assuring freedom from any adhesive, free-floating particles in the cleaner bath, which might later adhere to pickled ware.

Each drum of cleaner contains a package of starter, a special compound which, it is claimed, makes the cleaning action of a new batch of cleaner 100% efficient immediately.

Cleaner for Carbon Stained Aluminum

The Curran Corporation, manufacturing chemists in Malden, Mass., announce that their self-emulsifying solvent Gunk possesses the unique property of degreasing and leaving aluminum engine castings with a new silver-white appearance without any chemical effect, etching, or loss of weight of the metal.

This new emulsifying composition is said to be especially valuable in degreasing and cleaning airplane motors which have cast aluminum engine cases. The clean surface and the new casting appearance of the metal surface facilitates quick, accurate, visual inspection.

De-Opacifying Agent

The Porcelain Enamel and Manufacturing Company, Baltimore, Md., has recently developed a new de-opacifying agent known as Pemco Unifier, designed to correct the color of second and third coat enamel, thereby giving a perfect match in reworks, free of a specky finish.

Spray Booth Coating

Harris Soap Company, Buffalo, N. Y., has developed a colloidal liquid called "Boothcote", for application to the clean walls of a spray booth by the ordinary spray gun. After painting or lacquering operations the dried accumulation on the walls of the booth can be peeled off in sheets, thus eliminating a possible serious fire hazard.

Manufacturers' Literature

Cellulose-Acetate Rainbow-Hued Materials. Bakelite thermoplastic materials for injection and compression molding. Bakelite Corp., 247 Park Ave., New York.

Electric Marker and Electric Etcher. "Ideal" electric engraving tools; for all materials and very hard metals. Ideal Commutator Dresser Co., Sycamore, Ill.

Variable Speed Transmission; "Select-o-Speed"; uses standard "V" belts; sizes up to 7½ H.P. Available to all accredited business concerns for free trial demonstration, without obligation. Ideal Commutator Dresser Co., Transmission Div., Sycamore, Ill.

The Welder's Trouble Shooter. B.2150-A. Cause and cure for distortion, warping (thin plates), welding stresses, spatter, cracked welds, poor weld appearance, undercut, poor fusion, etc. Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

Adjustable Motor Drive Lathe: improved Pedestal type; available in all sizes of South Bend precision lathes. South Bend Lathe Works, 425 E. Madison St., South Bend, Ind.

Meter Control. Bulletin No. 102-B. Application of the Bailey steam flow-air flow automatic readjustment type of air-operated combustion control. Bailey Meter Company, Cleveland, Ohio.

Wire and Cable Strippers. "Ideal" hand, foot-operated and motor-driven types. Ideal Commutator Dresser Co., 1234 Park Ave., Sycamore, Ill.

Industrial Lighting—"The Meaning of the RLM Label"; a factual exposition of the principles of modern industrial light conditioning. A buyer's guide. Free on request. RLM Standards Institute, Room 1130, Civic Opera Bldg., Chicago, Ill.

Gauges. A folder on Power gauges, which can be attached to all standard Power cutters of any size or make. Power Gauges, 304 Hudson St., New York City.

"The Problem: the Solution". A series of products said to eliminate the defects due to the absorption of gases and oxidation of metals during melting. A "Foseco" product

for every type of alloy—aluminum, brass, bronze, etc. Foundry Services, Inc., 107 E. 41st St., New York City.

"Under Lock and Key". "Protectoglo" system for safeguarding against combustion hazards. Brown Instrument Co., division of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.

Automatic "Entrained Combustion" Motorized Fan Gas Burner Assembly. "Fan-Air". New features said to assure high efficiencies and quiet performance. Lee B. Mettler Co., 406 S. Main St., Los Angeles, Calif.

Air Helmets. New Pangborn. DD-4; with special fittings and connections for blasting protection. Pangborn Corp., Hagerstown, Md.

Spray Equipment. Catalog No. 66. Five tests of Eclipse low pressure principle (patented); Eclipse Air Brush Co., Inc., Newark, N. J.

Enamel Storage. Enamelers' Reference No. 2, by H. G. Wolfram, Manager, Technical Operations. The Porcelain Enamel & Mfg. Co., Pemco and Eastern Aves., Baltimore, Md.

"Test for Acid Resistance of Porcelain Enamels." Revised edition. Complete instructions under each classification for simple methods of determing the acid resistance of porcelain enamels. Porcelain Enamel Institute, 612 N. Michigan Ave., Chicago, Ill.

Molybdenum in Steel. A handsome leather-bound catalog, containing the following sections: Chromium-Molybdenum Steels; Nickel - Chromium - Molybdenum Steels; Nickel-Molybdenum Steels; Carbon-Molybdenum Steels; Manganese-Molydenum Steels; Silicon-Molybdenum and Chromium-Silicon-Molybdenum Steels, etc. Climax Molybdenum Co., 500—5th Ave., New York.

Recording Gauges. Bulletin No. 208. Recording gauges and accessories; the importance of spring construction. The Foxboro Company, Foxboro, Mass.

Instruments for Measuring and Controlling Temperature; indicating and recording types. Bulletin M-382. Thwing-Albert Instrument Company, 3339-41 Lancaster Ave., Philadelphia, Pa.

Metameter System for Telemetering: Bulletin No. 515. Detailed engineering information on the subject of telemetering instrument readings. The Bristol Company, Waterbury, Conn.

"Functions of the Sales Executive." Policyholders Service Bureau, Metropolitan Life Insurance Co., 1 Madison Ave., New York.

Tumbling Machines. Type "S," Type "F." With or without ball burnishing machine; set in a horizontal line or vertical in tiers. All motor-driven. Lupomatic Tumbling Machine Co., Inc., 4510 Bullard Ave., New York.

WATCH FOR THE COMING ISSUES OF METAL INDUSTRY!

The feature of the November issue will, of course, be a report of the National Metal Conference and Exposition, the advance description of which is the leading article of this issue. Reports of technical papers, discussion, descriptions of outstanding exhibits and other special features will be included.

In addition, of course, we shall have a number of important technical articles.

Notes on Metal Finishes. **Methods and solutions used to plate and finish the samples exhibited at the branches of the American Electro-Platers' Society at the recent convention in Milwaukee, by *P. H. Langdon* Assistant Editor.**

Concentrated Cyanide Copper Plating Solutions. **An investigation of the "Pan" bath using high metal concentration and high current densities, by Dr. C. B. F. Young and Gerald Reid.**

Standardization of Finishing Materials. **How to develop economy and uniformity through the application of a standardization program in selecting materials, by E. A. Zahn, General Electric Company.**

Depositing Uniform Thicknesses of Metal for Plating to Specifications. **The conclusion of the article begun in this issue, by Joseph Haas.**

A Report of the Papers on Electrodeposition **read at the October meeting of the Electrochemical Society.**

WATCH FOR THE COMING ISSUES OF METAL INDUSTRY!

What the Reader Says

Preventing Rust from Perspiration

Editor, METAL INDUSTRY:

On page 371 of August issue there is a question regarding how a mechanic may minimize rusting of tools he handles. Your answer suggests the use of a mineral oil-petrolatum mixture; also use of a powdered air-slacked lime in the operator's hands.

The latter procedure sometimes causes difficulty of another kind. The first suggestion was probably along the right lines, but the mineral oil-petrolatum mixture is not nearly so effective as a good soluble oil. The undersigned has had considerable experience along this same line and can assure the party who asked the question that if he will use soluble oil both on the tools and on his hands, he will receive a boon.

A good soluble oil is easily four times better protection than a mineral oil-petrolatum mixture.

CADILLAC MOTOR CAR DIVISION
General Motor Corporation
Detroit, Mich. L. A. DANSE,
Metallurgist.

New Books

Structural Aluminum Handbook. Published by the Aluminum Company of America, Pittsburgh, Pa. Size 5¾" x 8½". Price: $1.25.

This handbook is compendium of fundamental information regarding structural members fabricated from aluminum alloys. It replaces the last edition which was published in 1930. Considerable progress has been made since that year to the present in the building of structures employing these products. The handbook includes an extensive section on the characteristics, manufacture and fabrication of aluminum alloy structural products. The balance is confined to the design of structures using aluminum alloy shapes.

Bibliography on Industrial Radiography, by Herbert R. Isenburger, Published by the American Documentation Institute, 2101 Constitution Ave., Washington, D. C. Price 72 cents for copy in microfilm (35 mm. standard safety photographic film), or $3.32 in black and white prints, 8½" x 11", original typed script.

This new bibliography comprises 776 references on 52 pages; a supplement to the book by the same author on the same subject, published in 1934 by John Wiley & Sons, Inc., New York.

Republic Alloy Steels. Published by Republic Steel Corp., Cleveland, Ohio. Size 6 x 9, 256 pages.

A handbook on alloy steels with variable

reference data on the specifications, manufacture and applications.

A number of new features are included in this edition. Among the chapters are: Some Fundamentals of Ferrous Metallurgy; Water and Oil Hardening Steels; Physical Property Charts of a number of SAE Specifications, Steels and others; Steels Used in Various Industries, such as railroads, aircraft, etc.; Stainless Steels.

Symposium on Protecting Metals Against Corrosion. Published by the American Society for Testing Materials, 260 South Broad St., Philadelphia, Pa. Size 6 x 9; 24 pages, paper bound. Price 50 cents.

This Symposium was the technical feature of the American Society for Testing Materials, Detroit District Meeting, held in April 1938. The papers comprising the Symposium are as follows:

Corrosion-Resistant Alloys, by H. W. Gillett, Metallurgist, Battelle Memorial Institute.

Protection of Base Metals by the Use of Metallic Coatings, by C. E. Heussner, Materials Engineer, Chrysler Corp.

The Pre-Treatment of Metals, by R. J. Wirshing, Research Engineer, General Motors Corp.

Corrosion Protection by Means of Organic Coatings, by J. L. McCloud, Metallurgical Chemist, Ford Motor Co.

Technical Publications

New Procedure for the Analysis of Dental Gold Alloys, by Raleigh Gilchrist. Research Paper RP 1103, National Bureau of Standards, Washington, D. C.

From a study of conditions under which certain base metals known to be associated with native grain platinum could be collectively separated from the platinum metals and gold, a new procedure has been developed for analyzing dental gold alloys which differs essentially from that published by W. H. Swanger in 1926.

The procedure as applied to dental gold alloys provides for the separation and gravimetric determination of silver, iridium, tin, gold, indium, copper, zinc, nickel, palladium, rhodium and platinum. Briefly it is as follows: Silver chloride and metallic iridium are precipitated when the alloy is decomposed by aqua regia. Tin is next separated by a new technic of controlled hydrolysis. Gold is then precipitated by sodium nitrite, and next, by adjusting the alkalinity with sodium hydroxide to the end point of thymolphthalein, indium, copper, zinc and nickel are collectively separated from rhodium and platinum. At this alkalinity a small proportion of palladium precipitates with the base metals but is recovered from them with dimethylglyoxime. Palladium, rhodium, and platinum are separated from one another by the usual methods of this laboratory. The four base metals are separated, in order, by precipitating indium with ammonium hydroxide, copper and subsequently zinc, with hydrogen sulphide and nickel with dimethylglyoxime.

It was found that manganese, iron, cobalt and chromium are also quantitatively precipitated in a solution containing nitrite at the end point of thymolphthalein, and that it is possible to separate lead from palladium and platinum at the end point of xylenol blue, if the lead is precipitated as carbonate.

Suggestions are made for using the procedure as a refining method for crude material containing gold and the platinum metals.

Surface Tension of Vitreous Enamel Frits, by W. N. Harrison and D. G. Moore, R.P. 1133, Journal of Research, National Bureau of Standards, Washington, D. C.

The Constitution of the Alloys of Tin with Bismuth, by A. C. Davidson. Series A. No. 77. Technical Publications of the International Tin Research and Development Council, 149 Broadway, New York.

European Welding Practice and American Trends, by Chas. H. Jennings, Engineer in Charge of Welding Research, Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

Improved Method for Determination of Aluminum in Certain Nonferrous Materials by Use of Ammonium Aurintricarboxylate, by John A. Scherrer and William D. Mogerman. Research Paper No. 1117. Part of Journal of Research of the National Bureau of Standards, Volume 21, 1938.

Preparation of Ammonium Aurintricarboxylate, by John A. Scherrer and W. Harold Smith.

A procedure is described for the preparation of an ammonium salt of aurintricarboxylic acid which is satisfactory for use in the colorimetric determination of aluminum. The development of this procedure was necessary because a sensitive reagent could neither be prepared by existing methods nor purchased in the market. Research Paper No. 1118. Part of Journal of Research of the National Bureau of Standards, Volume 21, July 1938.

Determination of Arsenic, Antimony, and Tin in Lead—Tin—and Copper-Base Alloys, by John A. Scherrer. Research Paper 1116. Part of Journal of Research of the National Bureau of Standards, Volume 21, July, 1938. National Bureau of Standards, Washington, D. C.

Government Publications

Lead, by E. W. Pehrson and H. M. Meyer. Chapter from Minerals Yearbook 1938. Review of 1937. U. S. Dept. of the Interior, Bureau of Mines, Washington, D. C. Price 5c.

Zinc, by E. W. Pehrson. Chapter from Minerals Yearbook 1938. Review of 1937. U. S. Dept. of the Interior, Bureau of Mines, Washington, D. C. Price 5 cents.

Marking Articles Made of Karat Gold. Commercial Standard CS67-38. U. S. Department of Commerce, National Bureau of Standards, Washington, D. C. Price 5 cents.

Marking of Articles Made Wholly or in Part of Platinum. Commercial Standard CS66-38. U. S. Department of Commerce, National Bureau of Standards, Washington, D. C. Price 5 cents.

"Power Requirements in Electrochemical, Electrometallurgical and Allied Industries." Reported by Federal Power Commission, Release No. 522, Washington, D. C.

Respiratory Protective Devices Approved. A list of the approved devices published by the Bureau of Mines, U. S. Department of the Interior, Washington, D. C. This report designated as Information Circular 7030 may be obtained on application.

Associations and Societies

American Society for Testing Materials

260 South Broad Street, Philadelphia, Pa.

Under the auspices of the Philadelphia District Committee of the American Society for Testing Materials, headed by *N. L. Mochel*, Westinghouse Electric and Manufacturing Co. and *R. W. Orr*, RCA Manufacturing Co., chairman and secretary respectively, a dinner-meeting will be held at the Penn Athletic Club on Monday, October 17, at 6:30 p.m. *Dr. L. W. Chubb*, since 1930 Director of Research, Westinghouse Electric and Manufacturing Co., Pittsburgh, will lead the discussion with an address on "Fundamental Research in Industry." Concerned with research for over 30 years, Doctor Chubb has a background of wide experience. His subject is one of increasing importance and all interested persons are cordially invited to attend. Dinner reservations can be made by writing Mr. Mochel, A.S.T.M., 260 S. Broad St., Philadelphia, Pa.

Porcelain Enamel Institute

612 N. Michigan Avenue, Chicago, Ill.

The Third Annual Forum of the Porcelain Enamel Institute will be held at the University of Illinois, Urbana, Ill., October 12-14, 1938.

Twenty-six men of long experience in the industry will discuss the problems of applying porcelain enamel. Among the speakers at the annual banquet will be *Bennett Chapple*, vice-president of the American Rolling Mill Company, whose subject will be "New Frontiers."

National Safety Council

20 N. Wacker Drive, Chicago, Ill.

The Silver Jubilee Safety Congress and Exposition of the National Safety Council will be held at the Stevens Hotel, October 10-14, 1938, to celebrate the Council's twenty-five years of accident fighting. The program includes a panel of more than 500 chairmen, speakers and dicsussion leaders and the Congress will be accompanied by 130 exhibits, commercial and contributive including many working demonstrations.

Metal Section Day will be held on Friday, October 14.

Personals

Adolph Bregman

Adolph Bregman, Metallurgical Engineer, since 1919 Managing Editor of METAL INDUSTRY, has severed his connection with that journal as of October 1st and established an office at 123 William Street, New York, as a consultant in the metal products manufacturing and metal finishing industries. He will specialize on industrial problems, development of products and industrial markets, a field in which he has been engaged for a number of years. He has been Executive Secretary of the Masters' Electro-Plating Association of New York since 1934 and will retain that position.

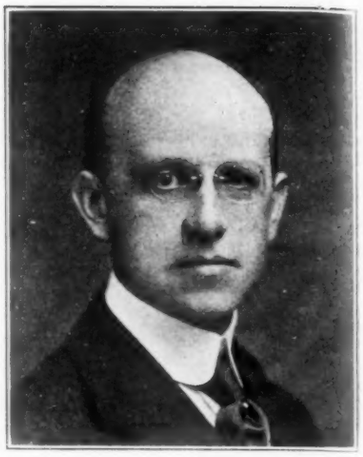
ADOLPH BREGMAN

Mr. Bregman is the author of a number of technical and industrial articles. He is a member of the Institute of Metals Division, A.I.M.E. and the American Society for Testing Metals.

William A. Cowan

William A. Cowan, Assistant Chief Chemist of the National Lead Company Research Laboratories, 105 York St., Brooklyn, N. Y., retired from his post on July 1st, 1938, because of poor health, after 39 years of continuous service with the company.

Mr. Cowan was born in Pittsfield, Mass., October 9, 1874, the son of James and Mary (Conyers) Cowan. He graduated from Amherst College with the degree of Bachelor of Arts in 1897 and was appointed Chemical Laboratory Assistant at the Brooklyn Polytechnic Institute, later becoming an instructor. In 1899 he went with the National Lead Company as chemist at the Crooke Works, remaining there until 1905. He was then transferred to the Research Laboratories in Brooklyn and in 1914 became assistant chief chemist.



WILLIAM A. COWAN

Mr. Cowan was specially interested and experienced in the metallurgy and metallography of lead alloys and white metals and the manufacture of all lead products. He has made numerous contributions to professional journals. He is a member of a number of technical and scientific societies.

All of Mr. Cowan's many friends in the metal industries wish him a speedy recovery to good health.

Metal Industry Detroit-Cleveland Representative

The publishers announce the appointment of Ernest E. Krack to the post of advertising and circulation representative for METAL INDUSTRY in the Detroit-Cleveland area. News items of interest in this important center of metal finishing will also be reported by him.

Following his graduation from Lehigh University in 1936 where he pursued courses of general engineering studies Mr. Krack was associated with the General Electric Company in Detroit.

ERNEST E. KRACK

Homer Kendall, formerly associated with the Alliance Machine Company, Alliance, Ohio, has been appointed to handle special engineering problems in sales work with the Salem Engineeriing Company, Salem, Ohio. Mr. Kendall's experience is mainly along the line of designing and building handling equipment for furnaces in industrial and forge plants including all types of cranes.

William N. Goggin of Goggin & Goggin Company, Chicago, Ill., has been appointed sales representative in the Chicago district for the Salem Engineering Co., Salem, Ohio. *F. R. Wilson*, Birmingham, Mich., has been made representative in the Detroit district.

J. W. Meriam has retired from the Lincoln Electric Co., Cleveland, Ohio, after 24 years as vice-president and secretary. Mr. Meriam has been an active force in both the Cleveland and the National Association of Credit Men. He was president of the Cleveland Association in 1924 and 1925 and a director of the National Association in 1925-1926. He has also been active in YMCA work. Although retiring from active service Mr. Meriam will remain a director of the Lincoln Company. The company's credits and collections will be handled by *Frank K. Griesinger*. *A. F. Davis*, vice-president, was elected secretary.

H. G. Danielson has joined the sales staff of the industrial oven division of the American Machine & Foundry Company, New Haven, Conn. Mr. Danielson has been identified with the oven and heating equipment industry for the past twenty years.

Dr. Richard M. Wick has joined the staff of the Development and Research Department of the Bethlehem Steel Company. Dr. Wick has been with the National Bureau of Standards since 1929. For several years he has acted as consultant on the protection and surface treatment of metals to the Bureau of Aeronautics, Navy Dept., principally at the Naval Aircraft Factory in Philadelphia, Pa.

R. T. Barnes, Jr., research metallurgist of the International Nickel Co., 67 Wall St., New York, described tests to determine what metals offer the best protection to color and clarity during the manufacturing of paints and varnishes, in a talk given September 7th, at the Fall meeting of the American Chemical Society, in Milwaukee, Wis.

O. M. Gibson, of Detroit, Michigan, formerly metallurgist, Dodge Brothers Corporation, was appointed Research Director of G. S. Rogers & Company, 228 No. La Salle St., Chicago, Ill., manufacturers of processing materials used in the heat-treatment and finishing of steel machine and automotive parts, core oils and metal cleaners. All production-control and research laboratories of the company's Middle West-

ern and Eastern Seaboard plants will be under his supervision. A graduate of the University of Detroit, Mr. Gibson was formerly field metallurgical engineer for J. B. Ford Company, and latterly Manager, Metal Working Research Department, E. F. Houghton & Co., Philadelphia. He is a member of many technical societies, including the A. S. M.

Milton T. Vreeland, for a number of years with Glidden Co. as sales representative, has joined the sales staff of the Hilo Varnish Corp., 42-60 Stewart Ave., Brooklyn, N. Y. Mr. Vreeland will operate in the Connecticut territory, as well as part of Massachusetts.

Max Alberts has joined the Sales Staff of the Hilo Varnish Corp., 42-60 Stewart Ave., Brooklyn, N. Y. in the capacity of trade sales representative in Texas.

Roy Teer has been appointed sales representative in New Orleans, La. and vicinity, for the Hilo Varnish Corp., 42-60 Stewart Ave., Brooklyn, N. Y.

Dr. George E. Barker has been appointed Industrial Fellow at the Mellon Institute of Technology, Pittsburgh, Pa., to work on chemical aspects of technical problems in the watch industry.

James R. Weaver, Director of Equipment, Inspection and Test for the Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa., will in addition to his present duties be responsible for equipment negotiations and the purchasing of capital account equipment.

H. L. Huxster, 1110 Darby Rd., Upper Darby, Pa., has been appointed district sales representative in Southeastern Pennsylvania and Southern New Jersey for the complete line of Trico products by the Trico Fuse Mfg. Company, Milwaukee, Wisc.

Obituaries

Vincent W. Allen

Vincent W. Allen, assistant works manager of the Bridgeport Brass Company, Bridgeport, Conn., died Thursday morning, August 25th, at the Waterbury Hospital in Waterbury, Conn. He was 49 years old.

Mr. Allen, who had been connected with the brass industry for 28 years, was born on October 6th, 1888 in New Milford, Conn., the son of the late William M and Caroline Weaver Allen. He was graduated from the Torrington High School, Andover Academy and as a Mechanical Engineer from the Massachusetts Institute of Technology in Boston. After his graduation, he was first connected with the American Brass Company in Torrington, Connecticut, as Master Mechanic. In 1923 he was transferred by the American Brass Company to the Toronto Mill at New Toronto, Canada, as Chief Engineer.

On July 1st, 1927, he went to Detroit as Works Manager of Michigan Copper and Brass, Inc. This company later merged with the Revere Copper and Brass Company, who sent Mr. Allen to Rome, New York in 1930, as General Manufacturing Manager of all of their mills, from which position Mr. Allen resigned in 1932. Shortly thereafter he took up his position with the Bridgeport Brass Company.

Mr. Allen, who was one of three executives of the Bridgeport Brass Company to make a tour of Europe in 1936 for the purpose of studying design and methods of production used in copper and brass mills of England and on the Continent, was, because of his long experience in the leading mills of the United States and former tours of Europe, one of the best informed engineers in the non-ferrous industry.

He is survived by his wife, Disa Braikett Allen, two daughters, Ann Joann and Joy and three brothers, James W. of Stamford, George H. of New Milford and Wilbur H. of Waterbury.

Henry Kramer

Henry Kramer, whose death was noted in our September issue, passed away at his home, 3800 Lake Shore Drive, Chicago, Ill., August 11th, at the age of 83. He was President and Treasurer of H. Kramer & Co., smelters and refiners of non-ferrous metals, which enterprise he had founded in 1888 under the firm name of H. Kramer & Son. This partnership was-

incorporated in 1904 as H. Kramer & Co., the year of 1938 marking the 50th Anniversary of the Company.

A pioneer in the non-ferrous metal field, Mr. Kramer displayed in his early years unusual courage, energy, and foresight, and these characteristics remained with him throughout his commercial career. His progressive policies, strict adherence to the highest business ethics and constant search for better products and methods gained for him national recognition as one of the leaders in the industry.

He lived a long and useful life, leaving the heritage of a "Good Name," the memories of countless kindly deeds both philanthropic and civic, and the love, admiration and respect of all who were privileged to know him. Mr. Kramer considered these attributes more precious to him than material success.

Mrs. Jennie A. Stratton

The death of Mrs. Jennie A. Stratton, wife of Wilbur G. Stratton of Bridgeport, Conn., occurred at her home, September 30, 1938, after a lingering illness. Her death was a deep loss to her many friends in the electroplating industry as she was an earnest worker in the activities of the Bridgeport Branch of the American Electro-Platers' Society since its founding. The pall-bearers were George Knecht, Ray O'Connor, Eugene Phillips and George Karl.

George E. Moore

George E. Moore, Wyandotte, Mich., aged 69, died in Henry Ford Hospital recently. Mr. Moore had been superintendent of the J. B. Ford Co., Wyandotte, for thirty-six years. He started work with the company as a stationary engineer in 1898.

Charles W. Owston

Charles W. Owston, 60 years old, vice-president of the McCord Radiator & Mfg. Company, Detroit, Mich., until 1931, died August 25 at Maplewood, N. J. Mr. Owston, who was born in Maplewood, had lived in Detroit twenty-five years. After leaving the McCord Company in 1931, he rejoined it two years ago and retired again in January, 1938.

Whitford Drake

Whitford Drake, 55, president, Electrical Research Products, a subsidiary of Western Electric Co., died August 24th.

Mr. Drake joined the Western Electric Company in 1924 as assistant operating superintendent of the Kearny Works. Later he was made operating manager of the commercial department of the company. He joined Electrical Research Products upon its formation in 1927, becoming vice-president in 1928 and president in 1937.

John W. Bunting

John W. Bunting, 56, vice-president of the Bunting Brass & Bronze Co., Toledo, Ohio, died recently following a month's illness. He was the son of the company's founder.

Verified Business Items

Metalwash Machinery Company, Inc., announces the removal of its New York office to the plant at 27 Haynes Avenue, Newark, N. J., to which all communications should be addressed.

Electrolux Corporation, Forest Avenue, Greenwich, Conn., has asked bids on general contract for one-story addition. Cost close to $50,000 with equipment. Executive offices are at 500 Fifth Avenue, New York. Departments: stamping, welding, grinding, polishing, plating, buffing, lacquering. Principal base metals used: brass, steel, aluminum and lead.

Hookless Fastener Company, Meadville, Pa., manufacturers of metal fasteners, etc., has let general contract for one-story addition and improvements in present plant.

Cost close to $70,000 with equipment. Departments: rolling, pickling, stamping, welding, grinding, degreasing, cleaning, plating, tumbling, burnishing, lacquering, enameling, finishing. Principal base metals used: steel, bronze, nickel silver, aluminum.

Mouldings, Inc., recently organized, will establish a plant in the Cole Building, Indianapolis, Ind., where it has leased 20,000 sq. ft. of space. The company will manufacture rolled metal moldings and light metal stampings. Officers are: *S. D. Murphy*, president; *A. F. Westlund*, vice-president; *F. V. Osborn*, secretary and *N. R. Kem*, treasurer. Departments: rolling, stamping, polishing, cleaning, buffing. Principal base metals used: brass, stainless steel, zinc and aluminum.

Independent Air Filter Company, 919 N. Franklin Street, Chicago, Ill., manufacturers of the Double-Duty, Kompak and Permo air filters, announces the appointment of new representatives for their New York and Philadelphia territories: *F. H. Herzsch*, 90 West Street for their New York office and *Robert Arnold Sales & Engineering Co.*, 2221 N. Broad Street, Philadelphia, Pa.

Wolverine Foundry Supply Co., 3237 Bellevue Ave., Detroit, Mich., has been organized with $50,000 capital by *Chas. D. Yahne, George A. Burman* and *August J. Becker.* The company manufactures core oils, core washes, core paste, special facings and binders, and jobbers of all other material and equipment used in foundries excepting metal and fuel.

Wright Aeronautical Corp., 132 Beckwith Ave., Paterson, N. J., has leased portion of property of Morrison Machine Co., Madison & Getty Avenues, about 39,000 sq. ft. of floor space, in vicinity of plant at first noted location, and will equip for machine shop for machining crankshafts and kindred operations. Departments: stamping, brazing, welding, grinding, sand blasting, polishing, degreasing, cleaning, plating, tumbling, buffing, anodic treatment, enameling, tinning.

Riverside Metal Co., Riverside, N. J., has been awarded the contract by the U. S. Treasury for bronze blanks in the amount of $39,250.

Charles Mundt & Sons, Jersey City, N. J., have been awarded with contract by the Navy Department for nickel-copper alloy; $10,208.

International Nickel Company, 67 Wall St., New York City, has been awarded a contract by the U. S. War Department for copper-nickel alloy cylinders; $118,485.

Trace and Warner, industrial designers, are now located in their new office, Rm. 1210, 155 North Clark St., Chicago, Ill.

USL Battery Corporation will devote the entire facilities of its Niagara Falls factory to the manufacture of automotive, radio and farm lighting batteries. The industrial battery division is being discontinued and the facilities will be devoted to the batteries listed above. Gould Storage Battery Corp., Depew, N. Y., has acquired the industrial battery division.

American Brass Acquires Roberts Brass

American Brass Company, Waterbury, Conn., has purchased the entire interests of the Roberts Brass Company, 229 East Lincoln Avenue, Milwaukee. In addition to making copper and brass goods, the Milwaukee firm has been an important distributor of American Brass products in the west. *M. J. Schaffner,* former president of the Roberts company and most of the other executives will continue with the new owner.

Electroplating Classes

Philadelphia

Classes for electroplating will be conducted by *Albert Hirsch,* instructor at the Jules Mastbaum Evening Vocational School, Frankford Ave. and Clementine St., Philadelphia, Pa. This course is endorsed by the American Electro-Platers' Society.

An elementary course in chemical analysis for electroplaters and electrotypers has been conducted for four years. The classes will now take up the electrochemistry of plating through a lecture course, with demonstrations in electrochemistry as applied to electroplating and electrotyping.

Full details can be obtained from the Philadelphia Branch of the American Electro-Platers' Society by writing to *R. E. Jackson, Jr.,* secretary, 125 East Allen St., Philadelphia, Pa.

New Haven, Conn.

The New Haven Branch of the A. E. S. will have a lecture entitled "Electro-Plating and Metal Finishing in the Automotive Industry" Thursday, October 13, at 8:15 P. M. at the Sterling Chemistry Laboratory of Yale University, 225 Prospect St., New Haven, Conn. Along with the lecture there will be a moving picture entitled "Tough Friends," a very interesting film on metallurgy.

The New Haven Branch will run a lecture course under the direction of Tom Chamberlain, starting Tuesday, October 25. This course will cover the fundamental principles and theory of the electro-deposition of metals.

Course in Metal Finishing

A course in metal finishing is offered by Polytechnic Institute, 99 Livingston St., Brooklyn, N. Y. This course, G175, is designed to enable the engineer to become familiar with the modern methods of applying protective and attractive coatings to metallic objects. As these coatings are generally applied to prevent corrosion of the metal the conditions producing corrosion and the theoretical explanation will be discussed. The various methods of preparing the surfaces such as degreasing, pickling and electrolytic cleaning as well as mechanical treatment will be presented. Such thermal processes as galvanizing, sherardizing, enameling as well as rubber coating will be studied. Electrolytic methods of depositing copper, nickel, chromium, tin, brass, black nickel, zinc, cadmium, silver and gold will be described. Specifications and testing of finishes will be included so as to give the students a method of describing and checking various finishes.

The instructor is *Dr. C. B. F. Young.* Fee, $25.

5,000-Year Metal Time Capsule

The Westinghouse Electric & Mfg. Company, E. Pittsburgh, Pa., has completed the casting and precision machining of a seven-foot "Time Capsule," made of their new copper base alloy, Cupaloy, which will be deposited 50 feet in the earth beneath the Westinghouse Exhibit Building at the 1939 World's Fair. This 800-pound metal alloy envelope will be addressed to people living 5,000 years from now and will preserve for scientists of 6939 A.D. a tangible record of life in our time and the secret of making this heat treatable copper alloy.

Metal Market Review

September 22, 1938.

Copper was under constant pressure—upward—during the past four weeks. Last quoted here at 10⅛c per pound, electrolytic, delivered Connecticut Valley, its price was increased on September 14th to 10¼c and on September 19th to 10⅜c. Foreign metal in the meantime kept consistently ahead of domestic, selling at this writing at 10.55c. Sales were variable, the figures week by week being 4,865; 4,260; 6,259 and 42,013 tons, a total of 57,397 tons compared with 47,192 tons in the previous five weeks. Domestic sales for August totalled 23,195 tons against 124,054 tons in July. World's stocks of refined copper declined 28,672 tons, the lowest point reached so far this year, the United States accounting for about 25,000 tons and Europe about 4,000 tons of this decline.

The consumption of copper seems to be steadily increasing and with the present indication that there will be no war in the immediate future, the market is firm.

Zinc which was last quoted here at 4.75c per pound E. St. Louis, was steady and became firmer week by week until September 15th, when the price was incrased to 4.85, and on September 19th, to 4.95. Statistics for August showed a drop in total stocks of 4,211 tons, the Prime Western division reporting a reduction of 4,946 tons due to increased shipments to consumers. Galvanizers have increased their rate of operations to about 60% capacity and shipments of high grade zinc have also improved. The market at this time is firm.

Cadmium was reduced to 65c-95c per pound from 75c to $1.05, it has been reported, due to foreign competition.

Tin spent a quiet month, with a little improvement in activity during the latter two weeks. Prices slid from 43c-44c per pound Straits to a little below 43c and then picked up a bit, the figure at this writing being 43.65c. Present situation, dull.

Lead for three weeks was unchanged from its last quotation here of 4.75c per pound E. St. Louis, but became steadily firmer. The foreign producers, it was reported, have agreed on the general terms for forming a new Cartel to regulate the

production of the metal. Sales week by week were 3,591 tons; 6,025; 15,488 and 16,906, a total of 41,010 tons against 23,405 tons in the previous five weeks. On September 15th the price was advanced to 4.85 and on the 19th to 4.95. Statistics for August showed that stocks of refined lead declined by 13,494 tons compared with a drop of 9,100 tons in July.

The market is firm.

Silver was steady and quiet throughout. The New York official price still remains at 42¾c per ounce Troy.

Scrap Metals, of course, were buoyant in sympathy with the primary market. For the first two weeks they fluctuated with light business done, but during the week of September 12th scrap copper bids were raised twice by refineries. In the following week, export scrap bids halted due to the vertical increase of war risk insurance rates for foreign shipments. The daily changes in the European situation near the last of September made export copper see-saw wildly but at the moment it is steadier though hesitant. Other scrap metals were also strong. Aluminum was slightly up and is still steady. The brass ingot business showed good deliveries but limited new orders. Of course, ingot prices advanced with the new metal figures.

On September 1st unfilled orders on the books of the members of the Non-Ferrous Ingot Metal Institute amounted to 14,237 net tons against 17,466 on July first.

Combined deliveries of brass and bronze ingots and billets for members during the month of August amounted to 5,018 tons compared with 3,936 tons in July.

The Institute reports the average prices per pound received by its membership on commercial grades of its principal mixtures of ingot brass and bronze during the 28-day period ending September 2nd.

	4 wks. end. Sept. 2	4 wks. end. Aug. 5
80-10-10 (1½% imp.)	12.331	11.930
78% Metal	10.882	9.329
81% Metal	10.250	9.500
83% Metal	10.500	9.996
85% Metal	10.618	10.301
No. 1 Yellow	8.908	8.636

Average Prices for Metals

	August
COPPER c/lb. Duty 4c/lb.	
LAKE (del. Conn. Producers' Prices)	10.187
ELECTROLYTIC (del. Conn. Producers' Prices)	10.125
CASTING (f.o.b. ref.)	9.65
ZINC (f.o.b. E. St. Louis) c/lb. Duty 1¾ c/lb.	
Prime Western (for Brass Special add 0.10)	4.75
TIN (f.o.b. N. Y.) c/lb. Duty Free, Straits	43.260
LEAD (f.o.b. St. L.) c/lb. Duty 2¼ c/lb.	4.75
ALUMINUM c/lb. Duty 4 c/lb.	20.000
NICKEL c/lb. Duty 3 c/lb. Electrolytic 99.9%	35.00
ANTIMONY (Ch.) c/lb. Duty 2 c/lb.	14.00
SILVER c/oz. Troy. Duty Free	42.75
PLATINUM $/oz. Troy, Duty Free	35.413
GOLD—Official U. S. Treasury Price	35.00

Supply Prices, September 29, 1938

Anodes

Prices, except silver, are per lb. f.o.b., shipping point, based on purchases of 2,000 lbs. or more, and subject to changes due to fluctuating metal markets.

COPPER: Cast ..... 20 c. per lb.
Electrolytic, full size, 15c.; cut to size .. 15 c. per lb.
Rolled oval, straight, 15½c.; curved ... 16½c. per lb.
BRASS: Cast ..... 18⅝c. per lb.
ZINC: Cast ..... 10 c. per lb.
NICKEL: 90-92%, 16" and over ..... .45 per lb.
95-97%, 16" " " ..... .46 per lb.
99%+cast, 16" and over, 47c.; rolled, depolarized, 16" and over, 48.
SILVER: Rolled silver anodes .999 fine were quoted Sept. 29, from 46c. per Troy ounce upward, depending on quantity.

White Spanish Felt Polishing Wheels

Diameter	Thickness Under ⅛"	⅛-15/16"	1-2"	2-3½"	Over 3½"
Under 1"	6.35-6.40	6.20-6.25	6.10-6.15	6.10-6.15	6.35-6.40
1" to 1 7/16"	5.85	5.70	5.60	5.60	5.85
1½" to 3 15/16"	5.55	5.35-5.40	5.30-5.35	5.30-5.35	5.60
4-5 15/16"	4.95-5.00	4.70-4.85	4.65-4.75	4.65-4.75	4.95-5.00
6", 8" & 9"	3.80-4.25	3.45-3.95	2.45-3.05	2.45-3.00	2.90-3.35
10" to 18"	3.80-4.25	3.45-3.95	2.45-2.95	2.45-2.85	2.90-3.25
Over 18"	3.80-4.25	3.45-3.95	2.70-3.05	2.70-3.00	2.90-3.35

Prices above are for less than 50 lb. For over 50 lbs. various discounts or deductions are allowed.

On grey Mexican wheels deduct 10c per lb. from above prices.

Cotton Buffs

Full disc open buffs, per 100 sections when purchased in lots of 100 or less are quoted:

16" 20 ply 84/92 Unbleached	$75.24
14" 20 ply 84/92 Unbleached	57.67
12" 20 ply 84/92 Unbleached	43.28
16" 20 ply 80/92 Unbleached	63.28
14" 20 ply 80/92 Unbleached	48.57
12" 20 ply 80/92 Unbleached	36.52
16" 20 ply 64/68 Unbleached	59.69
14" 20 ply 64/68 Unbleached	45.84
12" 20 ply 64/68 Unbleached	34.49

⅜" Sewed Buffs, per lb., bleached or unbleached 54c to 90c

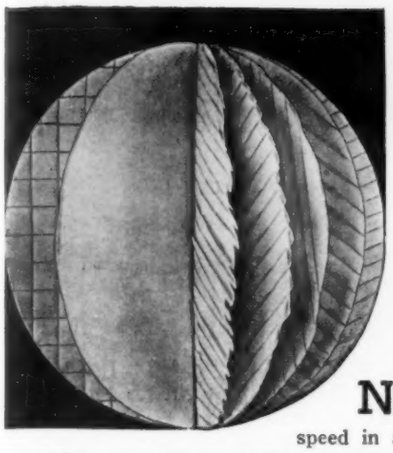
Chemicals

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone C. P. l.c.l. Drums	lb.	.06¼
Acid—Boric (Boracic) granular, 99½+% ton lots	lb.	.054-.059
Chromic, 100 lb. and 400 lb. drums		.16¾-.17¼
Hydrochloric (Muriatic) Tech., 20 deg., carboys	lb.	.027
Hydrochloric, C. P., 20 deg., carboys	lb.	.08
Hydrofluoric, 30%, bbls.	lb.	.07-.08
Nitric, 36 deg., carboys	lb.	.06
Nitric, 42 deg., carboys	lb.	.07½
Sulphuric, 66 deg., carboys	lb.	.02½
Alcohol—Butyl, drums (f.o.b. destination)	lb.	.09½-.10
Alum—Lump, barrels	lb.	.0340-.0365
Powdered, barrels	lb.	.0355-.0380
Ammonia, aqua, com'l., 26 deg., drums, carboys	lb	.02½-.05¼
Ammonium—Sulphate, tech., bbls.	lb.	.03½-.05
Sulphocyanide, technical crystals, kegs	lb.	.55-.58
Arsenic, white kegs	lb.	.04½-.05
Asphaltum, powder, kegs	lb.	.23-.41
Benzol, pure, drums	gal.	.41
Borax, granular, 99½+%, ton lots	lb.	.027-.032
Cadmium oxide, 50 to 1,000 lbs.	lb.	.95
Calcium Carbonate (Precipitated Chalk), U. S. P.	lb.	.05¾-.07½
Carbon Bisulphide, drums	lb.	.05¾-.06
Chrome, Green, commercial, bbls.	lb.	.22
Chromic Sulphate, drums	lb.	.26¼
*Copper—Acetate (Verdigris)	lb.	.25
Carbonate, 53/55% cu., bbls.	lb.	.15½
Cyanide (100 lb. kgs.)	lb.	.34
Sulphate, tech., crystals, bbls.	lb.	.0495
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.20¼-.20½
Crocus Martis (Iron Oxide) red, tech., kegs	lb.	.07
Dextrin, yellow, kegs	lb.	.05-.08
Emery Flour (Turkish)	lb.	.07
Flint, powdered	ton	30.00
Fluorspar, bags	lb.	.03½
*Gold Chloride	oz.	$18¼-23
*Gold Cyanide, Potassium 41%		$15.45
*Gold Cyanide, Sodium 46%		$17.10
Gum—Sandarac, prime, bags	lb.	.50
Shellac, various grades and quantities	lb.	.31
Iron Sulphate (Copperas), bbls.	lb.	.016
Lead—Acetate (Sugar of Lead), bbls.	lb.	.10-.12¾
Oxide (Litharge), bbls.	lb.	.12½
Lime Compositions for Nickel	lb.	.09½-.11
Lime Compositions for Brass	lb.	.09½-.11
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Methanol, (Wood Alcohol) Pure, drums l.c.l.	gal.	.40½
Nickel—Carbonate, dry bbls.	lb.	.36-.41
Chloride, bbls.	lb.	.18-.22
Salts, single, 425 lb. bbls.	lb.	.13½-.14½
Salts, double, 425 lb. bbls.	lb.	.13½-.14½
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash Caustic Electrolytic 88-92% broken, drums	lb.	.07¼-.08⅝
Potassium—Bichromate, casks (crystals)	lb.	.09¼
Carbonate, 98-100%	lb.	.06¾
Cyanide, 165 lbs. cases, 94-96%	lb.	.52½
Pumice, ground, bbls.	lb.	.03
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Sal Ammoniac (Ammonium Chloride) in bbls.	lb.	.05-.07½
*Silver—Chloride, dry, 100 oz. lots	oz.	.40¼
Cyanide, 100 oz. lots	oz.	.43
Nitrate, 100 ounce lots	oz.	.35
Soda Ash, 58%, bbls.	lb.	.0235
Sodium—Cyanide, 96% minimum, 100 lb. drums	lb.	.15
Hyposulphite, kegs, bbls.	lb.	.03½-.06½
Metasilicate, granular, bbls.	lb.	3.15
Nitrate, tech., bbls.	lb.	.029
Phosphate, tribasic, tech., bbls.	lb.	.03
Silicate (Water Glass), bbls.	lb.	.01½
*Stannate, drums	lb.	.30-.32
Sulphocyanide, drums	lb.	.30-.35
Sulphur (Brimstone), bbls.	lb.	.02¾
*Tin Chloride, 100 lb. kegs	lb.	.35½
Tripoli, powdered	lb.	.03
Trisodium Phosphate—see Sodium Phosphate.		
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
White Silica Compositions for Brass	lb.	.07½-.10
Whiting, Bolted	lb.	.02½-.06
Zinc—Carbonate, bbls.	lb.	.14-.15
Cyanide (100 lb. kegs)	lb.	.33
Chloride, drums, bbls.	lb.	.065
Sulphate, bbls.	lb.	.04

*Subject to fluctuations in metal prices.

Metal Prices on page 508.



Make A Shop Test Of Yerges Buffs

NO OTHER buff gives such economy and speed in all cutting and buffing operations as a Yerges buff because no other buff is designed and made in the same way. The square-stitched, pleated sections of special muslin are bias-cut and each piece is laid at a specified angle to the next piece. Pockets automatically form at the edge as the buff wears, holding and saving abrasive.

Yerges buffs are available for a wide variety of work, from the softest buffing to the hardest cutting. Let us send you samples and data. The Yerges Mfg. Company, Fremont, Ohio.

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Sets for Chromium, Nickel, Copper, Brass, etc.

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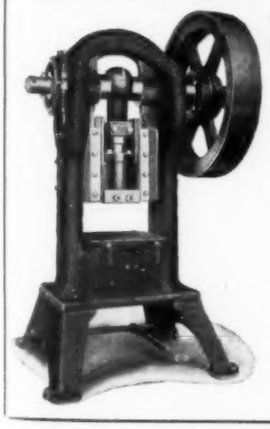

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ARE QUALITY PRODUCTS . . .

LEADERS in the Nickel Plating Industry have standardized on McGean Besplate 99% Nickel Anodes — Because

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2. Anode corrosion is excellent
3. Less frequent filtering of solution required

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From our complete line of Anodes and Plating Chemicals we call your attention to the following.

ANODES

Nickel (all percentages)	Tin
Copper	Brass
Cadmium	Zinc

CHEMICALS

Nickel Salts	Copper Sulphate
Nickel Chloride	Copper Cyanide
Nickel Carbonate	Copper Carbonate
Chromic Acid	Cadmium Oxide

Manufactured by

THE McGEAN CHEMICAL COMPANY
CLEVELAND, OHIO

McGEAN CHEMICALS

Metal Prices, September 29, 1938

(Import duties and taxes under U. S. Tariff Act of 1930, and Revenue Act of 1932)

New Metals

COPPER: Lake, 10.50, Electrolytic, 10.375, Casting, 9.90.
ZINC: Prime Western, 4.95. Brass Special, 5.05.
TIN: Straits, 44.375. Lead: 4.95.
ALUMINUM: 20. ANTIMONY, Ch. 14.00.
NICKEL: Shot, 36. Elec., 35.

QUICKSILVER: Flasks, 75 lbs., $75-78. BISMUTH, $1.05.
CADMIUM, .65-.95. SILVER, Troy oz., official pr. N. Y., Sept. 29, 42¾c.
GOLD: Oz. Troy, Official U. S. Treasury price $35.00.
SCRAP GOLD, 6¾c. per pennyweight per karat, dealers' quotation
PLATINUM, oz. Troy $36-39.

Duties: Copper, 4c. lb.; zinc, 1¾c. lb.; tin, free; lead, 2½c. lb.; aluminum, 4c. lb.; antimony, 2c. lb.; nickel, 3c. lb.; quicksilver, 25c. lb.; bismuth 7½%; cadmium, 15c. lb.; cobalt, free; silver, free; gold, free; platinum, free.

Ingot Metals and Alloys

	Cents lb.	U. S. Import Duty	U. S. Import Tax*
No. 1 Yellow Brass	9.00	None	4c. lb.[1]
85-5-5-5	11.00	None	4c. lb.[1]
88-10-2	14.25	None	4c. lb.[1]
80-10-10	12.75	None	4c. lb.[1]
Manganese Bronze (60,000 t. s. min.)	11.00	None	4c. lb.[1]
Aluminum Bronze	15.25	None	4c. lb.[1]
Monel Metal Shot or Block	28	25% a. v.	None
Nickel Silver (12% Ni)	13.00	20% a. v.	4c. lb.[1]
Nickel Silver (15% Ni)	15.25	20% a. v.	4c. lb.[1]
No. 12 Aluminum	15.50-19	4c. lb.	None
Manganese Copper, Grade A (30%)	22-27	25% a. v	3c. lb.[1]
Phosphor Copper, 10%	14.00	3c. lb.	4c. lb.[1]
Phosphor Copper, 15%	15.00	3c. lb.	4c. lb.[1]
Silicon Copper, 10%	21.50	45% a. v.	4c. lb.[1]
Phosphor Tin, no guarantee	50-60	None	None
Iridium Platinum, 5% (Nominal)	$40.50	None	None
Iridium Platinum, 10% (Nominal)	$42.00	None	None

* Duty is under U. S. Tariff Act of 1930; tax under Section 60 (7) of Revenue Act of 1932.
[1] On copper content. [2] On total weight. "a. v." means ad valorem.

Old Metals

Dealers' buying prices, wholesale quantities:	Cents. lb.	Duty	U. S. Import Tax
Heavy copper and wire, mixed	7 to 7¼	Free	4c. per pound on copper content
Light copper	6⅜ to 6½	Free	
Heavy yellow brass	4½ to 4⅝	Free	
Light brass	3¾ to 4	Free	
No. 1 composition	6⅝ to 6¾	Free	
Composition turnings	6⅜ to 6½	Free	
Heavy soft lead	4⅛ to 4¼	2½c. lb.	None
Old zinc	2½ to 2¾	1½c. lb.	
New zinc clips	3¼ to 3½	1½c. lb.	
Aluminum clips (new, soft)	12½ to 13	4c. lb.	
Scrap aluminum, cast	7 to 7½	4c. lb.	
Aluminum borings—turnings	4 to 4½	4c. lb.	
No. 1 pewter	23 to 25	Free	
Electrotype	4¼ to 4⅜	2½c. lb.*	
Nickel anodes	27 to 28	10%	
Nickel clips, new	28 to 29	10%	
Monel scrap	8½ to 15	10% av.	

* On lead content.

Wrought Metals and Alloys

The following are net BASE PRICES per pound, to which must be added extras for size, shape, quantity, packing, etc., or discounts, as shown in manufacturers' lists, effective since July 29, 1938. Basic quantities on most rolled or drawn brass and bronze items below are from 2,000 to 5,000 pounds; on nickel silver, from 1,000 to 2,000 pounds.

Copper Material

	Net base per lb.	Duty*
Sheet, hot rolled	18½c.	2½c. lb.
Bare wire, soft, less than carloads	14½c.	25% a. v.
Seamless tubing	19 c.	7c. lb.

* Each of the above subject to import tax of 4c. lb. in addition to duty under Revenue Act of 1932.

Nickel Silver

Net base prices per lb. (Duty 30% ad valorem.)

Sheet Metal		Wire and Rod	
10% Quality	25½c.	10% Quality	28⅛c.
15% Quality	26⅞c.	15% Quality	31⅜c.
18% Quality	27⅞c.	18% Quality	34¼c.

Brass and Bronze Material

	Yellow Brass	Red Brass 80%	Comm'l. Bronze	Duty	
Sheet	16⅞c.	17⅝c.	18⅝	4c. lb.	U. S. Import Tax 4c. lb. on copper content.
Wire	17⅛c.	17⅞c.	18¾	20%	
Rod	12¾c.	17⅞c.	18¾	4c. lb.	
Angles, channels	25⅜c.	26⅛c.	27⅛	12c. lb.	
Seamless tubing	19⅝c.	20⅛c.	21	8c. lb.	
Open seam tubing	25⅜c.	26⅛c.	27⅛	20% a. v.	

Tobin Bronze and Muntz Metal

(Duty 4c. lb.; import tax 4c. lb. on copper content.)

Net base prices per pound.	
Tobin Bronze Rod	18¾c.
Muntz or Yellow Rectangular and other sheathing	20¼c.
Muntz or Yellow Metal Rod	16¼c.

Aluminum Sheet and Coil

(Duty 7c. per lb.)

Aluminum sheet, 18 ga., base, carload lots, per lb.	33.00c.
Aluminum coils, 24 ga., base price, carload lots, per lb.	28.50c

Rolled Nickel Sheet and Rod

Net Base Prices

Cold Drawn Rods	50c.	Standard Cold Rolled Sheet	49c.
Hot Rolled Rods	45c.		

Monel Metal Sheet and Rod

Hot Rolled Rods (base)	35c.	No. 35 Sheets (base)	37c.
Cold Drawn Rods (base)	40c.	Std. Cold Rolled Sheets (base)	39c.

Silver Sheet

Rolled sterling silver (Sept. 29) 45c. per Troy oz. upward according to quantity. (Duty, 65% ad valorem.)

Zinc and Lead Sheet

	Cents per lb. Net Base	Duty
Zinc sheet, carload lots standard sizes and gauges, at mill, less 7 per cent discount	9.75	2c. lb.
Zinc sheet, 1200 lb. lots (jobbers' prices)	10.75	2c. lb.
Zinc sheet, 100 lb. lots (jobbers' prices)	14.75	2c. lb.
Full Lead Sheet (base price)	8.00	2¾c. lb.
Cut Lead Sheet (base price)	8.25	2¾c. lb.

Block Tin, Pewter and Britannia Sheet

(Duty Free)

This list applies to either block tin or No. 1 Britannia Metal Sheet, No. 23 B. & S. Gauge, 18 inches wide or less; prices are all f. o. b. mill:

500 lbs. over	15c. above N. Y. pig tin price
100 to 500 lbs.	17c. above N. Y. pig tin price
Up to 100 lbs.	25c. above N. Y. pig tin price
Up to 100 lbs.	25c. above N. Y. pig tin price

Supply Prices on page 506.

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